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Editorial Notes.

A series of reviews on the work of agricultural stations and experimental farms in and outside India will form a special feature of this journal in future and the current number begins with Madras farms. We trust this aspect of agricultural journalism will interest our readers. We request them to help us with their well-considered criticisms and contributions under this head.

Agricultural Farms.

During the last twenty years, hundreds of co-operative societies have sprung into existence. Capital which was dubbed very shy before, has freely flowed. Yet the mass of the people in the countryside has hardly moved. The Legislature and Government have not been unmindful. Acts like the Punjab Land Alienation Act, the Deccan Agricultural Relief Act, the Bengal Tenancy Act, the Agricultural Loans Act, the Land Improvement Act which were passed, have given some

The country-side.

relief and been amended from time to time. The result however has been from the villagers' point of view, the replacement, perhaps in a more subtle form, of one kind of oppression by another. The toiling peasant feels that his lot ever remains the same, the intentions of the Legislature notwithstanding. The root causes of the evils remain untouched. Only certain palliatives are suggested and they fail of their purpose because the methods are unsuited and unsuitable. The uncanny cultivator continues to be the toy of ill—informed politicians, subtle lawyers, helpless judges, angry administrators, the pouncing trader and the hasty doctor. The town and the noisy men therein still claim disproportionately greater attention. The unlettered yet cultured and humble villager is left in the cold.

Eminent Indians like Dadabhai Nowrojee, and R. C. Dutt, have with excellent intentions, erred we believe in raising wrong issues. It is not the land-tax that is oppressive. It is not the Permanent Settlement that will prove a panacea for all the present ills. The oft-quoted prosperity of Bengal is beside the point and is simply illusory. It is said that Nero was fiddling while Rome was burning The accumulation of large landed properties or unused or ill-usable wealth in the hands of a small irresponsible and unfeeling section of the population does not add to the vitality of the nation nor conduce to its well-being or progress. Parasitism, whether in the plant or the animal kingdom, saps the vitals of the helpless host which remains a weakling and eventually dies. A very vigorous, self-reliant and independent peasantry which was the dream of Sir Thomas Munro, must be built up anew. Greater

attention ought to be paid to rural problems and rural welfare. Questions touching the unobstrusive aud nervous villager must be freely, frankly and constantly discussed with him and *with him alone* and not with a self-constituted proxy or an interested middleman.

Statements like "the increasing absorption of gold shows the increasing prosperity of a country" "indebtedness grows with prosperity" are to be taken at their face value. The histories of England and America prove the incorrectness of such views. Superfluous hands must be weaned from the pursuit of agriculture or their dependance on it and their attention, diverted into channels, openings for which must be free and regulated by the individual's capacity for advancement.

An idle brain contrives to do mischief and brings ruin on the possessor and his kinsfolk. To keep the countryside busy, village industries must be encouraged and industrial and landbanks brought into effective operation so that a thriving village population may engage itself on honourable and health-giving pursuits and be free from the baneful effects and undetectable machinations of an outwardly polished, and devitalised urban society.

Empire Mycology.

A central organization known as the Bureau of Mycology has been established in Kew, England for the encouragement and co-ordination of work throughout the Empire on the diseases of plants caused by fungi in relation to agriculture. The Committee of Management consists of some of the foremost biologists in Britain with Viscount Harcourt as their chairman.

Dr. E. J. Butler, late Imperial Mycologist, Pusa is Director. The Bureau will work broadly on the lines of the existing Imperial Bureau of Entomology at South Kensington. It will be a central agency for the accumulation and distribution of information and for the identification of specimens sent in from all parts of the Empire.

Mysore Calendar.

The Mysore Agricultural Calender for 1921 has been published. It contains very useful articles of a practical nature written by specialists who know the subject. The ground covered is wide and almost all subjects in which the ryot is interested have been ably dealt with. The language is simple and the aim is amply fulfilled. The treatment leaves nothing to be desired and the booklet contains matter which can form food for reflection not only for Mysoreans but also gentlemen engaged in farming in other parts of the country. Monthly notes are a special feature of the publication which adds to its usefulness. Each copy is priced one anna and should be found in every rural home.

Comparative study of the Mulberry silk industry in the different parts of the world.

K. ACHYYA, SERICULTURAL EXPERT.

The Mulberry silk Industry which is the queen of the textile industries and which is an important key industry may be divided into six distinct economic organisations each independent of the other and yet forming a peculiar combination of its own. These are (1) cultivation of mulberry (2) rearing of silk worms—an art

A paper read at M. A. S. Union Confirence on 22-12-1920.

which has been very highly specialised since the worm is domesticated (3) manufacture of silk-worm eggs known as seed where the use of microscope for moth examination has reduced the silk worm diseases to a minimum in highly developed sericultural contries (4) treatment of cocoons i. e., the reeling of raw silk wastes including pierced cocoons (6) manufacturing of silk fabrics out of raw and spun silks after the processes of twisting, bleaching, dyeing, weaving, finishing and designing. These six functions of the silk industry representing as they do six distinct economic organisations are more or less similar in all the silk producing contries of the world, but the degree of success attained by each is dependent upon many other conditions. Chief amongst them are an abundant supply of mulberry, suitable climate, cheap and willing agricultural or semi-agricultural population in the case of 1 and 2. Skill, knowledge and efficiency of labour forces employed in the case of 3 and 4 and highly complicated devices in the form of machinery and the like used in 5 and 6.

The first two parts may be termed an agricultural pursuit in asmuchas the cultivation of mulberry and the seasonal silk-worm crop of cocoons is concerned. Since the worm is domesticated and this branch of the industry is purely carried on in the cottages of agriculturists, it is termed a 'Cottage Industry' and is known as such all the world over. It is this aspect of the industry where machinery plays absolutely no part that has given the eastern nations where agricultural labour is satisfied with little returns, a decided advantage over the western nations and has highly complicated the international trade in raw silk.

The manufacture of seed has become a highly specialised art after the system expounded by that eminent French scientist Pasteur of microscopically examining every mother moth that lays eggs to find out the quality of the seed. This discovery has been the means of eliminating the worst form of silk worm disease known as pebrine or bringing it down to its lowest minimum.

This has demarcated seed industry from the rearing industry in highly developed sericultural countries and being the controlling factor of diseases is in its turn controlled by the respective Governments under a 'guarantee'.

The reeling industry may be termed the 'border line between the cottage industry and the manufacturing industry. In some silk producing countries, this branch of the industry is very highly developed by the system of 'Filatures' where the system of steam heating basins and the application of motor power for the purposes of turning the reel have replaced the old 'primitive method of heating basins by the ordinary fire wood and turning the reels by the human agency which are still in vogue in Bengal, Mysore and Kollegal in India and in parts of China. It is to these primitive appliances employed that the poor quality of the Indian raw silk which finds no sale abroad and few competitors in India is due.

Silk wastes are what may be termed the by—products of the silk industry including long and short fibre wastes secured in the process of brushing and cleaning the cocoons to find out the true filament; pierced cocoons—naturally pierced or otherwise in the act of brushing or rough handling in reeling; double cocoons in India (in other countries they are reeled); and the thin wrapper left over after the cocoons are almost used up. In Kashmir in India and in all other countries silk wastes are graded, cleaned, and sold in an unadulterated state, whereas in India the wastes are sold with all the dirt they contain including chyrasalids. By not observing the proper system of grading and cleaning, India loses annually an enormous sum of money.

All the wastes are cleaned, carded and spun in spinning mills and sold as spun silk. There are two such mills in Bombay. There is sufficient material for one mill in Mysore and Kollegal.

Chrysalids are another byproduct the oil of which when extracted is used in the manufacture of soaps. In India, it is generaly wasted. In China, it is a table delicacy.

Silk weaving: It is this branch of the industry that consumes the total output of raw silk except small quantities used in the manufacture of baloons, parachutes and cartridge bags which found their way to the trenches in the last war. The importance of reserving the silk industry as a great national asset comes in when the high arts of civilization are displayed in the colouring, designing and finishing of silk fabrics. No other fibre presents the same wide scope for this art. The system of state bounties and subsidies given in France for the coccon producing and raw silk industries is to preserve this high national art in silk weaving.

The chief silk producing countries of the world are:—Japan including Corea; China including Indo-China; Italy, France, Asia-Minor and the Levant including Persia and India including Kashmir. Of these countries Japan and Italy have marched forward rapidly both in the production of cocoons and raw silk. China, France and Persia are more or less stationary; figures for Asia-Minor and Levant are wanting and hence cannot be classified. India except Kashmir is on the decline. The reasons for this state of affairs are not far to seek. A critical survey of each country would, I believe, give the silk Industry in India ample object lessons for remodelling her primitive organisations and overcoming the lethargy, indifference and prejudices of the silk worm rearers, reelers and weavers, to adopt more advanced and rational methods.

Japan and Corea:— Japan with its sturdy peasantry ever alive to the advancement of their country in all spheres of life with a climate pre-eminently suited for sericulture, an abundance of cheap and efficient agricultural labour for rearing and reeling and with a paternal government giving every encouragement to those engaged in the industry in various ways with a lavish expenditure of money, it is no wonder Japan is on the forward move supplying a little less than half the total produce of raw silk of the world. Besides individual efforts the activity of the Government may be summarised thus :—

1. Two higher sericultural institutes in Tokyo and Kyoto for advanced course and research besides eight prefectural institutes and five country institutes.

2. Four prefectural schools and thirteen country schools besides many private schools for educating the rural population.

3. Courses of study in agricultural, and forest colleges, besides agricultural stations, include sericulture.

4. Subsidies are given by the Government for enlarging mulberry plantations.

5. Circuit lecturers are employed by Government, prefectures, counties, towns and sericultural associations to direct those in the industry. Some of them are whole-time lecturers, others are recruited from amongst the graduates of the year for the season.

6. As many as fifty competitive exhibitions are held annually with government help to encourage rearers and reelers.

7. Special laws are enacted whereby individual rearers are not allowed to manufacture seed in order to protect them from disease. There are as many as three thousand employees of the central and prefectural governments who visit seed establishments and certify as to their quality. A sum of 20 lakhs is spent on this work alone by the Government.

8. In addition to the above Government support numerous sericultural guilds. Silk worm seed guilds, raw silk guilds, rearers guilds etc. attached to the central silk association with its head quarters at Tokyo and with a prince of the royal house invariably as its president, are in active existence helping the industry in every way possible besides issuing literature in a cheap and popular form for the guidance of its members.

9. Co-operative societies form another important factor in the wholesale purchase and sale. There are as many as one thousand three hundred societies helping the sericulturists in the country.

10. Conditioning house of Yokohama fulfils a function which is most necessary to improve the quality of raw silk and detect fraud by testing the humidity in silk and by degumming also.

11. Above all, the Empress takes a keen interest in the industry in having a small mulberry garden of her own in the palace grounds and rearing worms.

Corea:— All that has been done for Japan is being done for Corea after it became a protectorate and the result has been that in the course of about ten years the acreage under mulberry and the cocoon production has increased almost fourfold.

Italy:— Italy with an intelligent and thrifty agricultural population; a suitable climate and rich soil for the cultivation of mulberry; a highly developed system of rearing worms evolved after years of patient study by Italian sericultural savants, new breed of crosses withstanding disease and enriching the silk fibre in the cocoons and above all the highly efficient and almost perfect state of the silk filatures, which has given Italy *the premier rank in the classic silks in the raw markets of the world*—these and many other causes have added to the prosperity of the Italian silk industry. The Government of Italy has also thrown itself heart and soul into the industry by opening sericultural institutes and schools for research and education work and by liberal industrial subsidies and bounties to private enterprise. The conditioning house at Milan and the great attraction of Milan as the world's central market for raw silk and surplus cocoons has added in no small measure to the rapid growth of the Italian filatures—and the development of the Italian silk market of the world.

China. Conditions in China are very favourable for the rapid growth of a cottage industry like the silk industry with an industrious and teeming agricultural population accustomed to rearing worms from time immemorial, but the want of a stable government

and the vicissitudes of changing politics and civil strife, want of proper transport communications, have been some of the causes for the stationary nature of the industry. If China had unity of action and the Government of China could give all the facilities for her sericulturists as Japan in the opening of a conditioning house, the manufacture of disease-free seed and subsidies for enlarging mulberry plantation &c., the growth of the Chinese silk industry would have been phenomenal.

The establishment of steam filatures at Canton and its neighbourhood which receive cocoons through the splendid high way of the Yang-tse-kiang river has given a good name to China's silk in the world's market and thus improved the cocoon industry to a good extent by getting better values. Country reelers have also improved their silk by the introduction of re-reels.

It is interesting to note that the climate of Southern China is similar to that of Southern India—particularly Mysore plateau—and the breed of cocoons is the polyvoltine worm just as in Bengal, Mysore and Kollegal, whereas in Northern China as in Northern India (Kashmir), the univoltine worm is reared—the difference of course is largely one of climate.

Indo-China. The French Government has not been slow to take advantage of the good climatic condition of the country and an indigenous breed of the worm to develop the silk industry to its utmost capacity. The sericulturists of France tried first of all to rear univoltine French worms which failed, then tried the method of hybridisation and infusion of new blood which also failed and lastly succeeded in improving the indigenous breed by a *careful system of selection.* There is a lot for India to learn out of this system of careful selection and the great revival accomplished thereby since many of the agricultural conditions of Indo-China resemble that of India. The chief help given by the Government is the supply of disease-free seed *free of cost* from small inexpensive rearing centres scattered all over the country.

France. Favourable conditions prevail in Southern France for a progressive industry, but the agricultural labour engaged in rearing is not satisfied with the returns though it is a purely supplementry iudustry undertaken just before the agricultural harvest work. The industry is only kept up through the efforts of the French Government by a system of bounties and subsidies paid on a liberal scale both to the cocoon and raw silk producers. The national importance is attached to the high arts of civilization displayed in the manufacturing industry. The system of bounties alone cost the French Government as much as fancs 200,000. With all the bounty system, I am of opinion that the aggressive policy of the Far Eastern silk market and the improving of quality annually which has already complicated the international trade in raw silk will deal a 'knock-out' blow to the French silk industry unless some other means besides bounties is found for eliminating such silks.

Persia. The periodical political changes have affected Persia's silk industry just as that of China. It is well suited to the growth of univoltine worm. This industry is peculiarly suited to Persia where the Zenana system prevails and women can take an active part in the rearing operations.

India. There is no part of the world where the industry is so scattered as in India, though concentration would have given many advantages, The chief silk producing areas are Kashmir, parts of Bengal, Mysore plateau and Kollegal. Other Provinces and Indian states are yet in an experimental stage and so not worth noting down in a narrative like this.

Kashmir. The industry has been in existence for many years on a small scale and it would have died a natural death if the State had not come to its rescue by bringing the industry under a state monopoly. The remarkable growth of the industry under the state control and the large revenue its brings to the state as well as to the agriculturists has often been discussed in the public press as an example of an industry fostered by the state contributing largely to

the prosperity of the agricultural population of the state. Hence a side light into the working of this department would be of some interest.

The sericultural department of Kashmir and Jammu—each independent of the other—is controlled by the Settlement Commissioner with the Revenue Minister responsible to the Durbar. The department controls the mulberry trees of the state by laws enacted making it penal to cut down even a branch thicker than a man's thumb—the penalty for each offence and for cutting down each tree is as much as Rs. 10. The rules are enforced through the Revenue Department. The tree mulberry has been growing wild abundantly in Kashmir valley and sparsely in Jammu province and efforts are being made by the department to extend the plantation by issuing seedlings from the many state nurseries. Rewards are given to village headmen who take interest in the mulberry cultivation and to individual ryots who plant them largely. The leaves are allowed to be used *only for silk worm rearing* by any rearer, no matter on whose land the tree stands.

Rearing. The univoltine seeds largely imported from Italy and France and hibernated in Srinagar and Balote are distributed free to the rearers according to the season and supervised by the assistants and inspectors of the department. Copper sulphate for disinfection and arsenic for killing rats are also distributed free along with seed. The climate being ideal, the cocoons are as good as those produced in France and Italy. Recently efforts are being made to increase the local production of seed which is proving a great success. As much as 45,000 oz. of seed are distributed annually in both the provinces which, I believe, is the limit for the existing number of mulberry trees. The cocoons are bought by the state paying almost Rs. 50/ per dry maund regardless of quality. Those taluks near about the filatures bring in cocoons in green state which is taken by measurement and others bring in a dry state. Almost 6 lakhs of rupees are received by the rearers for cocoons besides cloth rewards given to individual rearers for extra good quality of cocoons.

The village headmen receive a small commission on cocoon production for providing house accommodation and similar other help to those rearers who are without enough accommodation, since rearing is conducted largely on the ground floor and also for giving help to the Sericulture Department in the oversight of mulberry trees in their respective villages. The Sericulture Department is given a voice in the appointment and dismissal of village headmen to make their work effective. The tahsildars also receive rewards from the department for extra good help given.

Reeling. There are two state filatures in the headquarters of the two provinces viz. Srinagar and Jammu. The Srinagar filature is the biggest individual filature in the world employing as many as 7000 workmen and is complete with every modern equipment. The Jammu filature is a small one with 200 basins. The silk reeled is of a very high quality but the Department had to overcome a lot of prejudices against the Indian silks in the European markets, and has succeeded eventually in classifying the Kashmir silk differently as it ought to be, since the silk is from the superior univoltine cocoons unlike the Bengal and Mysore cocoons and reeled in the most modern style. The chief markets for Kashmir silk are France and Italy.

Silk waste. Is all cleaned, graded and sent to France and Italy.

Weaving. It was tried on a pretty big scale by the engagement of an expert from England but was given up as not paying. It is being started again by a private Indian gentleman on a small scale, the state giving him some help.

Income. The net income to the state during the last four years is nearly 30 lakhs of rupees though the income before the war did not exceed 10 lakhs.

Summarising Kashmir efforts, what one could say as regards the other provinces of India is this:—

All along the Himalayas including the Punjab and northern part of United Provinces, the industry can be successfully started

by first importing disease free univoltine seed from France and Italy. It can even be made a state monopoly in the beginning since *gentle pressure* is necessary to induce the ryots to take it up and then handed over to private enterprise if found necessary.

Experience of Kashmir will considerably help towards its success.

Bengal. The multivoltine breed of worms known as 'Nistari and Chotu polu' is reared, feeding them on bush mulberry. The return from the industry is not much owing to the disease amongst worms and the presence of the parasite fly called "Ujji" and hence there was a great decline until the Government stepped in and started seed—distributing nurseries in several places. The chief object of these nurseries is to rear cocoons very carefully and distribute them as seed cocoons. The existing nurseries are not many and so Government can save the industry by multiplying these useful seed nurseries and supplying all the seed necessary and eliminate the disease altogether.

Reeling is done on primitive methods and with no regard to quality. The silk is sold all over Northern India for the use of the Indian hand looms. There were two or three firms notably Messrs. Lorins Payne & Co., of Lyons, Anderson Wright & Co., of Calcutta who putup modern filatures to find a sale for the Bengal raw silk in the European markets but they have given up the business after many years of work owing, I believe, to the increased cost of cocoons, high wages and the deterioration in the quality of the cocoons and not the over—anxious European markets to buy Bengal silk.

Mysore and Kollegal. The variety known as the Mysore variety of polyvoltine worms is reared all over the Mysore plateau including Kollegal, feeding the worms on the bush variety of leaves which grows well. The life of the bush in Kollegal is about ten years when the plantation is removed and some other crop is grown for a year and the land is again brought under mulberry the following year. The bush is propagated by cuttings. The mulberry land is

not irrigated in Kollegal though in many parts of Mysore the land is irrigated and more than 5 crops, which is the general average in Kollegal, are taken. The system followed in all branches of the iudustry is the same in Mysore and Kollegal.

About 15,000 acres is under mulberry cultivation in Kollegal taluk and about the same number of families engaged in rearing. The mulberry cultivator is not always the rearer and the rearer is not always the silk reeler.

The methods employed both in rearing and reeling may be termed "primitive". The chief defects in rearing are :— overcrowding of worms, ill ventilation, defective system of cleaning the litter, heaping the litter in the cattle sheds which are generally very near the rearing rooms; non-disinfection of rearing implements such as stands, trays and chandrakies. These defects may be remedied by patient work by overcoming many of their prejudices but it would require time. But the great loss to the rearer in this taluk is the use of seed cocoons from Mysore rearers which are not always free from disease. The loss thereby is as much as 20 % of the entire crop annually. It is only the supply of disease—free seed under a guarantee that will not only bring prosperity to the Kollegal rearer, but also increase the acreage under mulberry. The net income from an acre of mulberry (only poor quality land is brought under mulberry) in dry land is Rs. 150 at present and it will be much more if the disease is eliminated and if such land is utilised. If the mulberry cultivator is a rearer, the income is much more.

The reeling industry is also carried on in the villages off and on at the cocoon season-the methods used are most primitive—no regard is paid for the quality of the silk, its lustre, tenacity, elasticity and least of all size and winding properties. The silk finds an easy sale all over South India in the silk—weaving towns such as Conjeeveram, Kumbakonam, Coimbatore, Dharmavaram, Salem. The prices realised are good, considering the quality of the silk. If the silks are well reeled and the sales extended to French and Italian markets, it ought to find a good sale considering the brilliancy of the Mysore quality silks unsurpassed among raw silks.

Silk waste. Being uncleaned waste just as it comes from the reeling basin, the prices realised are almost nothing. If it is graded and cleaned, it would find a good value and good sale abroad.

Weaving. There are about 400 silk looms in Kollegal using local silk but specialised in weaving high grade saries. The workmanship displayed is excellent but the bad quality of silk mars the quality of the cloth to a great extent.

Mysore is trying its best to supply disease-free seed from state seed nurseries, but the attempt for the last 12 years has only brought the supply to almost ten per cent of the total quantity necessary. In Kollegal, the idea is to supply disease—free seeds to all the rearers and maintain it so that the rearers need not bring in seed cocoons from Mysore. Besides this, the improvement of the worm will be effected by a hill farm at Coonoor which has already been started.

Summary of what other countries are doing which can be copied out in India with advantage.

1. Supply of disease-free seed as in Indo-China and free if necessary.

2. System of bounties and industrial subsidies as in France to preserve the higher arts of civilization displayed in the silk handloom industry of India.

3. Opening of a higher Sericultural Institute etc. as in Japan.

4. Improvement of the indigenous breed by a system of careful selection as in Indo-China.

5. Introduction of other varieties and hybridization should not be attempted.

6. Extension of the industry to all suitable centres if necessary by bounties given to mulberry cultivation as in Japan.

7. Improvement of raw silk by encouraging private individuals to put up modern filatures.

7. System of wholesale purchase and sale of raw silk by co-operative societies as in Japan.

8. Improvement of waste silk.

9. Extraction of oil from chrysalides for the manufacture of soap.

News and Notes.

A London despatch to Washington says that a syndicate of capitalists of the Western States has leased 600,000 square miles of Siberian land from the Russian Government.

The All-India Cow Conference for 1920 was held at Nagpur, Central Provinces during the National Week.

Seed-wheat from the famous Plant-breeding Station, Slavof, Sweden, is being introduced into the Scotch market. One or two small parcels sown in 1919 yielded crops of 60 to 65 bushels an acre. Its merits are great hardiness, high yield and resistance to yellow rust. The variety—Iron wheat—is sold at 120 to 135 shillings per 504 lbs.

At the last July Council meeting of the Royal Agricultural Society of England it was resolved to close the Woburn Farm and experiments which entail a loss of £ 1200 a year and yield results in which only 0·3 per cent of the members take any interest.

Returns relative to the financial position for 1919 of the Scottish Small-holders Organization Ltd., are unsatisfactory and according to the Scottish Farmer, November 13th, show that it is an institution kept alive by the subsidies from the Board of Agriculture.

From a White Paper published it is understood that from 150 farms visited the total yield of milk during the period, October 1,

1919 to April 30, 1920 in England and Wales was 1,22,990 gallons and in Scotland 572,196 gallons. In the former case the average yield of milk per cow per day was 1·476 gallons and in the latter 1·574. In England the average weight of ration purchased and home-grown per day was 62·95 lbs., in Scotland 89·15.

According to Mrs. Hobbs who was the lecturer at the opening meeting for session 1920—21 of the Glasgow and West of Scotland Agricultural Discussion Society, milk is hardly used at all in country districts in the United States of America.

Professor Wallace, observes the Scottish Farmer, said in his opening lecture on Colonial and Indian Agriculture delivered on 14-10-20 that the "great secret of the Gartun system of Pantl-breeding was due to the introduction of multiple crossing, involving in most cases the blend of wild and weedy but robust and vigorous species and also the regeneration resulting from the use of pollen from different plants within the same species. By these means the tendency to degeneration liable to occur among self-fertilised and the intensely in-bred crop plants was overcome and increased vigour and crop producing power was obtained."

Mr. E. S. Beavan in a paper read to the Farmers' club, London, comes to the conclusion that inherited characteristics alone are useful in breeding. The predominant factor of productivity in cereals is the seed farming energy of the individual plants composing the crop. The ratio of grain to straw is the measure of the factor. This is closely correlated with yield of grain per acre. A consistently higher ratio can be obtained in cross bred races than is present in either of the two parent races.

Madras Farms:—(1) Attur.

This village is situated on the Chingleput—Arkonam line of the South Indian Railway.

At the instance of Mr. (Now Sir) A. Chatterton, Professor of Engineering on special duty, who was investigating the availability of ground water in the sandy bed of the Palar on the eastern bank of which Attur stands, a small area was acquired for pumping experiments, a well was sunk and a pump, fitted up.

The site was however handed over, for an experimental station, to the Agricultural Department in October 1905. The old well proved unsatisfactory. Another was sunk and the whole installation, transferred to the control of the Deputy Director of Agriculture in September 1906.

The soil is poor light sand and part of the site had been lying waste from time immemorial.

The rainfall averages about 46 inches distributed as under:—

April to May	2·0 inches.
June to September	18·4 „
October to December	25·0 „
January to March	0·9 „

The climate is milder than in the inland districts. Hot weather rains are received but are precarious. West winds blow a great part of the year and at times with violence. September is the most important month for sowing when twenty-five per cent of the dry land and thirty-three per cent of the wet lands are sown.

The object with which work was started here was "the thorough trial of perennial and exotic cottons under irrigation, the growth of fodder crops and experiments in fruit cultivation."

The area taken was 69·13 acres of which 64 acres was brought under cultivation and the estate was divided into two blocks by the main road from Chingleput to Conjeevaram.

Soon after possession was given, the land was cleared and cottons, sown in 1905—06 but were however late. The varieties tried were the exotic, Sindh-acclimatized Egyptian cotton, Caravonica, Sea Island and American cottons:—(1) Russel, (2) Truit, (3) Mattis, (4) Christopher, (5) Chiese, (6) Whittle, (7) W. A. Cook, (8) Boyd's Prolific, (9) Koley's Prolific, (10) Harendon, (11) Cameron, (12) Dearing, (13) Mathew's Long Staple, (14) Texas Burr, (15) Braddy, (16) King's Improved, (17) Smith's Improved, (18) Dickens and the indigenous Jadapathi and Pamidipathi varieties and Seemapathi.

Egyptian gave 130 lbs. kappas an acre.

Caravonica which was both sown and transplanted grew luxuriantly but did not fruit before the rains in 1906. Sea Island was fair with 210 lbs. kappas an acre on a plot of 66 cents. Some American varieties did well and they averaged 510 lbs. an acre.

At the end of the season all cottons were pruned. In the second season they started well, became sickly in December following, but recovered later.

A few sorghum varieties were tried for two seasons and Talaivirichan gave the highest straw with 2467 lbs. an acre. Rayachoti cumbu grew well but was caught in the rains in December and the yield was poor.

Cowpeas, horsegram, blackgram, and greengram were sown and the crops ploughed in, sunhemp failed from insect pests and lucerne from Bangalore was disappointing.

A further trial with cottons did not come up to expectation, it soon became evident that the Farm was quite unsuited for the purpose for which it was intended owing to the extreme poverty of the soil and its porosity. It was accordingly closed in 1908.

Letter.

Crowthorne,
Southbourne, Hants,
December 31st, 1920.

To
The Secretary,
Madras Agricultural Students' Union,
Coimbatore.

Dear Sir,

I am much obliged to you for your letter about the Conference and the kindly wishes which accompanied it. I trust the Conference, which by now is over, was a great success. I shall see an account of it in the paper, no doubt, but at present I am rather out of touch with Madras, as my subscription apparently expired some time ago and though I have sent a fresh one, I have not yet received my paper.

There have been many changes since I left which have left the staff at the College and indeed throughout the Department, very different from what it was at this time last year. There can be little doubt, I think, to any one who knows anything of the working of the Department for the last ten years, that Mr. Sampson's absence even for a short time will be most severely felt.

Conditions in England are of course very different to what they were when I was last here. It is difficult for me, accurately to say just what the differences are, because I have only had six months' experience of my own country since 1905—when I first came to India, but of course the primary and most noticeable difference is the very much higher cost of living. Fortunately for us Indian servants home on leave, this has been largely counterbalanced by the very high rate of exchange which made my saved rupees fetch nearly twice as many pounds sterling as

they would now for instance. Then there is an intitution called Income Tax. I wonder how many of you in India realise that all except very small incomes, pay 6 in every 20 direct to the Exchequer, or to the Government, as we should say in India, as Income Tax.

There are however signs that prices are coming down, and in any case, I do not wish to fill this letter with further laments, for in one way and another I am really enjoying my leave most thoroughly. I have joined a local Badminton Club. I can see some of my old students smiling at this, as I expect they remember my expressing my feeling about this game—but they must remember that it is Winter, and that it is dark soon after 4 P. M. It is also wet and windy and any out-door game, except golf, is almost impossible and so twice a week I play Badminton in a large Hall with a shuttle cock, not a ball. This is a cork core with feathers stuck in it and is extemely rapid in its flight for short distances, but drags a good deal and consequently one tends to be late for short shots, and easily for long ones, but it is good fun and provides plenty of exercise. Then I have been attending the Bournemouth School of Art. I took in some of my cove designs to the Principal and after discussion with him have taken up 'Desing' work and a course on "Lettering"—I shall have some wrinkles to impart to the College Artists if and when I return.

I am also doing a little, rather intermittently I fear to write up my lecture notes on Agriculture, with a view to printing them. Of course, it is quite likely that no publisher will take them, (I wonder if so whether I could persuade the Union to give me anything for them?) but I must produce something, as a start, before one can approach the publishers, and so I have bought a type-writer and sit down at my study table when I get the chance. I have a good bit done already and some of the illustrations, and have resolved, (one of these well known New

Year resolutions, no doubt) to devote February and early March to it. I am going out of England from the month of January to Switzerland and France. When the days begin to get a bit longer and the temperature warmer, I hope to spend more time exploring England by road in my little car.

I have also been assisting in some smaller theatrical performances in aid of various local charities, which have taken up a good deal of time, but have been financially successful, and have afforded me considerable amusement and some experience for the theatrical performances at the College, which I hope still go on.

I had the unusual experience of snow, the other day. It was some time since I had seen that, as you may imagine. I was in London at the time and took the opportunity to see the Houses of Parliament and Westminster Abbey, with their architectural features emphasised by the white covering.

Well—I suppose, Mr. Secretary, that you won't consider I have done my duty unless I impart an agricultural tinge to this letter (this sounds like an extract from a report of a Committee of Rural Education). Well—so far as I have been able to gather, farming or at any rate corn growing is a profitable industry at present, in spite of the very high wages paid to all farm labourers. Wheat and barley still sell very high. Live stock are scarce and expensive, and as British farming depends on the keeping of a large number of animals to consume the straw grown on the land to return it in the shape of manure, it seems likely that modifications of this practice must take place. In Agriculture, as in every thing else, state restrictions have increased and there has recently been much discussion in Parliament on an Agricultural Bill, which aims at giving the Government powers in certain conditions to compel good farming, on the ground that the land is really the nation's, and that it is essential to grow as

much food as possible in the country and minimise the risk of being starved out in case of another war. Locally all dogs have to be muzzled, owing to an outbreak of rabies in the neighbourhood. For many years this country was absolutely free of this dreadful disease but unfortunately in some way—it is said by aeroplane—the germ was introduced and outbreaks from time to time occur. "Efficient muzzling"—every dog of whatever size must wear a wire cage like muzzle over his head, whenever he is loose or outside the house,—will of course stamp it out, since if no dog can bite another, he cannot spread the disease. Well, I must end this letter, or the Editor will be muzzling me. I wish the Union and its members a prosperous and pleasant New Year.

Yours Sincerely,
(Sd.) R. Cecil Wood.

Departmental Notes.

Promotions and appointments :—

1. Mr. P. A. Raghunathaswami Ayyangar, III grade permanent to be I grade S. P. T. on Rs. 200 vice Mr. T. V. Ramakrishna Ayyar on other duty.

2. Mr. T. Lakshmana Rao, III grade permanent to be II grade S. P. T. on Rs. 175 vice Mr. S. Sundararaman on other duty.

3. Mr. S. R. Venkatakrishna Mudaliar III grade permanent to be II grade S. P. T. on Rs. 175 vice Mr. B. Viswanath on other duty.

4. Mr. K. Ramayya, IV grade permanent to be III grade permanent in an existing vacancy and to be II grade S. P. T. on Rs. 175 vice Mr. Rao Sahib Y. Ramachandra Rao on other duty.

5. Mr. K. Cheriyan Jocob IV grade permanent to be III grade S. P. T. on Rs. 150 vice No. 1.

6. Mr. P. S. Jeevanna Rao, IV grade permanent to be III grade S. P. T. on Rs. 150 vice No. 2.

7. Mr. C. R. Sreenivasa Ayyangar, IV grade permanent to be III grade S. P. T. on Rs. 150 vice No. 3.

8. Mr. V. Ramanatha Ayyar, Farm Manager, V grade on Rs. 50-5-100 to be Assistant to the Cotton Specialist, III grade S. P. T. vice No. 4.

9. Mr. S. N. Chandrasekaran S. P. T. Assistant, Madras Museum to be III grade S. P. T. on Rs. 150 vice Mr. G. N. Rangaswami Ayyangar, on other duty.

10. Mr. K. T. Balaji Rao, Farm Manager, on probation V grade on Rs. 50-5-100 to be Assistant in Economic Botany, IV grade on Rs. 75, 75, 75-5-125 on probation.

11. Mr. M. P. Gowrisankara Ayyar, Farm Manager on probation on Rs. 50-5 100 to be Assistant under the Government Sugarcane Expert on Rs. 75, 75, 75-5-125 on probation.

12. Mr. S. Ramachandra Ayyar, Agricultural Demonstrator, to be Assistant IV grade, Science Section on Rs. 75, 75, 75-5-125 on probation and posted to the Entomological section.

13. Mr. S Narayana Ayya, transferred to the Koilpatti Agricultural Station in relief of Mr. A. Chinnathambi Pillai.

14. Mr. P. Krishnayyar, Sub-Assistant to the Marine Biologist, Fisheries Department and S. P. T. Assistant in Entomology to be Assistant in Entomology with effect from 25-6-1920.

Leave:—

1. Mr. M. Mangesha Rao, Agricultural Demonstrator, Mangalore, privilege leave for one month from or after 15-2-1921.

2. Mr. H. Burrows, Assistant Farm Manager, Sim's Park, privilege leave for 6 months from date of relief.

3. Mr G. L. Narasimha Rao, Assistant Farm Manager, will be considered to have been on one month's furlough from 7th November 1920.

4. Mr. P. Abisheganatham Pillai, Agricultural Demonstrator, VIII Circle privilege leave for 11 days from 3-1-1921 with permission to avail himself of holidays from 31-12-1920 to 2-1-1921.

5. Mr. G. S. Narayanamurthy, Assistant Farm Manager, extension of one month's leave on medical certificate in continuation of the one month's leave already granted.

6. Mr. J. Lakshmiah, Assistant Farm Manager, privilege leave for one month from 9-11-1920.

Resignation :—

7. Mr. S. Vedantham Ayyangar, Farm Manager.

February.

Appintments, promotions etc :—

1. Mr. S. Dharmalinga Mudaliar, Farm Manager, to be S. P. T. Assistant in Economic Botany with effect from 1-1-1921 on Rs. 75, 75, 75-5-125.

2. Mr. V. S. Ramaswami Ayyar, Assistant Agricultural Demonstrator, promoted to the Upper division Agricultural section V grade on Rs. 50-5-100 with effect from 1-2-1921.

3. Mr. K. Ramanadha Ayyar. ,, ,,

4. Mr. T. S. Venkatrama Ayyar. ,, ,,

5. Mr. L. Sankarakumara Pillai. ,, ,,

6. Mr. V. Achutharamiah, appointed to the V grade, Agricultural Section upper division on Rs. 50-5-100, on probation and is posted to the I Circle.

7. Mr. N. Subrahmanya Ayyar, ,, ,, and is posted.

8. Mr. A. Chidambaram Pillai, posted to the Paddy Breeding Station.

9. Mr. K. G. Sankappa Bhandary is posted to the Ootacamund gardens as Farm Manager.

10. Mr. C. S. Namasivayam Pillai, Assistant Agricultural Demonstrator, Pollachi, to Central Farm to join on return from leave on 13-2-1921.

11. Mr. D. S. Subrahmanya Ayyar, Assistant Farm Manager, Central Farm to Anamalai Farm on relief by No. 1.

12. Mr. P. S. Jeevanna Rao, Assistant in Botany, privilege leave for two months from or after the 21-2-1921.

13. Mr. K. Avadanayama Pillai, Agricultural Demonstor, Conjeevaram, privilege leave for one month from or after 15-2-21.

14. Mr. M. Rathnaji Rao, Agricultural Demonstrator, privilege leave for one month on or after 1st March 1921.

Leave :—

1. Mr. C. R. Sreenivasa Ayyangar, Assistant in Economic Botany, privilege leave for 6 weeks from 10-2-1921 with permission to avail of the succeeding Easter holidays from 24th to 29th March 1921.

2. Mr Kamil Subba Rao Naidu, Assistant Agricultural Demonstrator, privilege leave for 15 days from 11-2-1921.

3. Mr. M. Ramachandra Naidu, Assistant Agricultural Demonstrator, privilege leave for 15 days from 5-3-1921.

March.

Appointments, promotions and transfers :—

1. Mr. K. Thomas, Assistant in Mycology is confirmed in his appointment on Rs. 75-5-125 with retrospective effect from 1-2-1919.

2. Mr. M. Krishnasami Ayyangar, Assistant Farm Manager is posted for duty as Sub-Assistant under the Cotton Specialist.

Leave :—

3. Mr. D. Ananda Rao Garu, Acting Professor of Agriculture and Superintendent of Central Farm, privilege leave for 1½ months from the 1st May to 15th June 1921.

4. Mr. T. V. Rajagopalacharya, Assistant Professor of Agriculture will, during Mr. Ananda Rao's absence be placed in charge of the office of Professor of Agriculture and Superintendent of the Central Farm in addition to his duties.

5. Mr. T. V. Rajagopalacharya, Assistant Professor of Agriculture, privilege leave for 32 days from the 30th March 1921 with permission to prefix the Easter holidays to the leave.

6. Mr. A. Gopalan Nayar, Agricultural Demonstrator, privilege leave for 6 weeks from or after 15-3-1921.

7. Mr. T. G. Anantharama Ayyar, Assistant Agricultural Demonstrator privilege leave for 45 days from or after 15th March 1921.

8. Mr. C. Arulanandam Pillai, Sub-Assistant under the Cotton Specialist, extension of privilege leave for one month.

9. Mr. K. E. Viswam Ayyar, Assistant Farm Manager, Samalkota, privilege leave for 25 days from 5-2-1921.

10. Mr. T. Lakshmipathi Rao, Assistant Agricultural Demonstrator privilege leave for one month from or after 1st April 1921.

11. Mr. P. S. Srinivasa Ayyar, privilege leave for one month from 28th February 1921.

12. Mr. C. S. Namasivayam Pillai, Assistant Farm Manager, Central Farm, extension of leave on loss of pay for one day viz., 13-2-1921.

13. Mr. J. Sundara Rao, Bhatgoswami, Artist, Entomology Section, extension of privilege leave for two weeks from 3-3-21.

Resignation :—

14. Mr. K. Govinda Poi, Agricultural Demonstrator, has resigned.

Leave :—

1. Mr. K. Narayana Ayyangar, Farm Manager, Anakapalli privilege leave for 10 days from date of relief.

2. Mr. V. Muthusami Ayyar, First Teaching Assistant, Agricultural College, Coimbatore, privilege leave from 9-4-1921 to 14-6-21 both days inclusive.

3. Mr. M. P. Kunhikutti, Farm Manager in charge of the Agricultural College Dairy, privilege leave for two months with effect from or after 10-4-21

4. R. Swami Rao will be in charge of the Dairy during the absence of No. 3.

5. Mr. M. Raman, Farm Manager, Central Farm, privilege leave for 2½ months in continuation of the Easter holidays.

6. Mr. T. V Narayana Rao, Farm Office Manager, Central Farm, privilege leave for six weeks from date of relief.

7. Mr. K. T. Bhandari, Teaching Assistant, Agricultural College, will be in charge of the Farm office during the absence of 6.

8. Mr. P. Vishnu Somayajulu, S. P. T. Assistant in Mycology, privilege leave for six weeks from or after 12-4-21.

April.

Appointments :—

1. Mr. N. Munisappa, Veterinary Assistant of the Veterinary Department, is appointed as Veterinary Assistant, Agricultural College, Coimbatore.

2. Mr. S. Viravaradha Raju, Assistant Agricultural Demonstrator, from VI Circle to VIII Circle to join by 1st May 1921.

3. Mr. K. K. Subrahmanya Ayyar, Agricultural Demonstrator, from IV Circle, to VIII Circle to join at an early date.

4. Mr. L. Narasimha Acharya, Agricultural Demonstrator, from IV Circle to III Circle to be in charge of the Hagari Farm. To join at an early date.

5. Mr. S. P. Fernando, Assistant Farm Manager, from Palur to the Central Farm, Coimbatore to join at an early date.

6. Mr. P. V. Raghavendra Rao, Assistant Farm Manager, Central Farm, to VIII Circle to join on relief by No. 5.

7. Mr. M. U. Vellodi, Farm Manager, Taliparamba, to the Agricultural College, as Teaching Assistant to join by 15th June 1921.

8. Mr. T. V. Srinivasa Charlu from V grade to VI grade with effect from 3-5-1921.

9. Mr. P. S. Venkusami Ayyar, from V grade to IV grade with effect from 23-3-1921.

10. Mr. G. Sitharama Sastri.
11. Mr. S. Viravaradha Raju.
12. Mr. A. K. Ganesha Ayyar.
13. Mr. K. S. Ramana Rai.
14. Mr. V. Chidambaram Pillai.
15. Mr. C. Arulanandam Pillai.
16. Mr. P. Vishnu Somayajulu.
17. Mr. C. Krishnan Nair.
18. Mr. S. Ramaswami Raju.
19. Mr. P. Susainathan.
20. Mr C. S. Gopalasami Rao.
21. Mr. R. Thomas.

} from V grade to IV grade with effect from 1-4-1921.

22. Mr. G. N. Rangaswami Ayyangar, Assistant Economic Botanist, privilege leave for 3 weeks from 30-3-1921.

23. Mr. K. Cheriyan Jacob, Assistant in Systematic Botany, privilege leave for six weeks from 20-3-1921.

24. Mr. V. Achyutham Pantulu, Assistant Agricultural Demonstrator, privilege leave for 25 days and furlough on half pay in continuation thereof for one month and five days from or after 10-4-1921.

35. Mr. P. A. Raghunathaswami Ayyangar, Assistant in Agricultural Chemistry, privilege leave for two months from 1-4-21.

26. Mr. A. Venkobachar, Assistant Agricultural Demonstrator, privilege leave for 20 days from 1-4-1921.

27. Mr. C. V. Seshacharya, Agricultural Demonstrator, V Circle, privilege leave for four months from or after 25-4-1921.

28. Mr. S. Jobitha Raj, Assistant in Economic Botany, privilege leave for one month and 8 days from or after 27-4-1921.

29. Mr. T. Budhavidheya Rao, Teaching Assistant, Agricultural College, privilege leave for one month and a half with effect from or after 1-5-1921.

May.

Appointments :—

1. Mr. K. Kodialbail Timmappa Alwa, Temporary Assistant Director of Agriculture, to be Assistant Director on probation and work in IV Circle, Vellore.

2. Mr. B. Dasappa Malli, is appointed Assistant Farm Manager, V Grade, Lower Division and posted to the Siddapur Coffee Experimental Station tor training.

3. The following Lower Subordinates of the Agricultural Station have been admitted to the Diploma Course :—

1. Mr. T. G. Anantharama Ayyar, Asst. Agricultural Demonstator.

2. Mr. K. S. Ramana Rai, Asst. Farm Manager.

3. Mr. C. Rangayya Nayudu, Asst. Farm Manager.

4. Mr. M. Chinnaswami Nayudu, Agricultural Demonstrator.

5. T. A. Rangaswami Ayyangar, Asst. Farm Manager.

4. Mr. Thomas, Sub Assistant to the Government Sugarcane Expert, to act as Asst. in Botany in that section on Rs. 75, 75, 75-5-125 vice Mr. K. Krishnamurti Rao on other duty or until further orders.

5. Mr. A. Moses, Plant Collector, Govt. Sugarcane Expert's Office to act as Sub-Assistant on Rs. 35-3½-50 vice No. 4.

6. Mr. C. Tadulingam, Assistant Lecturing Botanist, and Assistant Principal, privilege leave for 3 weeks from 16-5-1921.

7. Mr. T. V. Ramakrishna Ayyar Assistant Govt. Entomologist, will act as Assistant Principal in addition to his duties during the absence of No. 6 and will be eligible for a temporary duty allowance of Rs. 50 per mensem so long as he performs the duties of Assistant Principal.

8. Mr. T. S. Ramasubrahmanya Ayyar, Asst. to the Govt. Agricultural Chemist, privilege leave for 6 weeks from or after 23-5-1921.

9. Mr. John A. Muliyil, Assistant to the Govt. Entomologist, privilege leave for two weeks from 29-4-1921.

10. Mr. C. Arulanandam Pillai, Assistant Farm Manager, privilege leave for 19 days and furlough for one month and 11 days in continuation of leave sanctioned already.

11. Mr. K. Raghavacharya, Farm Manager, Palur, privilege leave for one month from date of relief.

12. Mr. C. V. Ramaswami Ayyar, Asst. to the Govt. Agricultural Chemist, privilege leave for four weeks from or after 12-5-1921.

13. Mr. C. Sundararama Ayyar, Lecturer in Agricultural Engineering, privilege leave for 3 weeks from date of relief.

14. Mr. A. S. Nilakanta Ayyar, Assistant Farm Manager, privilege leave for 3 weeks from or after 20-5-21.

15. Mr. T. Lakshmipathi Rao, extension of privilege leave for one month in continuation of the one months' leave already sanctioned.

16. Mr. K. Shiva Rao, Assistant in Chemistry, privilege leave for 26 days from 19-5-21.

17. Mr. M. Ramunni Kidavu, Assistant Farm Manager, Tenmalai Rubber Station, privilege leave for 26 days from or after 2nd May 1921.

18. Mr. Mohammad T. S. Azizuddeen Sahib, Sub Assistant in Economic Botany, privilege leave for 7 weeks from or after 6-5-1921.

19. Mr. A. K. Ganesha Ayyar, Assistant Agricultural Demonstrator, privilege leave for two months from or after 1st June 1921.

20. Mr. K. P. Sankunni Menon, Farm Manager, privilege leave for three months from or after 8th July 1921.

21. Mr. W. Raghava Charya, Farm Manager, Sugarcane Breeding Station, privilege leave for two months from or after 3rd June 1921.

22. Mr. S. Kuppuswami Ayyangar, Farm Manager, Samalkota is appointed vice No. 21.

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Vol. IX. August 1921. No. 2.

Editorial Notes.

The Government of India Act passed in 1919 has secured greater privileges for the rural population. "Privilege" carries with it knowledge, capacity, a willingness to work for the common good and a readiness to shoulder the responsibility on the part of any one who aspires for citizenship. The Montford Reforms, coming as they did in the wake of the cataclysmic war, have, it is true, added to the burdens of the tax-payar but at the same time they have also shown him the sure path, if he is so minded, for solid reconstruction and attainment of his goal. The veil has been partially lifted. The Indian villager who had during several centuries relinquished his status and forgotten his importance in the body politic has now been made alive to his position and his strength. It would be no one else' fault if he is not wakeful and lets slip the opportunities that lie before him. He has a large stake in the country. He should use his brains wisely and well. He must

The ryot and the Madras Legislative Council.

modulate his movements with steadiness and great circumspection. That he will acquit himself well there is not the least shadow of a doubt. The blood of the farmer-poet (Pothanna) who would not leave his plough in order to prostitute his muse for an ephemeral pride in kissing as a courtier, the hands of his mighty sovereign is still surging in his veins.

The Indian villager is sober. That others value his friendship and realise he can no longer be ignored are only matters of recent experience.

No better testimony is needed to show his neglect in the past and the potent influence he is coming to wield under the new order of things than the attention paid to agriculture and kindred subjects in the local Legislative Council, the first business session of which commenced on Febru ary 14th last when His Excellency the Governor devoted a large part of his opening address to problems bearing on Agriculture and the agriculturist. His Excellency's references to the introduction of measures defining the "principles of Land Revenue Settlement" "the rights and obligations of landowners and others in respect of irrigation," "the relation of landlord and tenant in estates" and to the extension of the "Malabar Compensation for tenants Improvements Act to the undeveloped areas of Wynaad, and the amendment of the "Cattle Diseases Act" are all reassuring. The development of the ports which are 73 in this presidency to which allusion was made is an equally important matter which would aid the producer and the consumer to come closer and ensure a better understanding between the nations of the earth.

The un-official members' endeavours to elicit information on vital matters affecting the rural interests were strenuous, 35 out of 72 questions put for the first day relating to agricultural points.

Our Ministers

The minister for Development, the Hon'ble Rao Bahadur K. Venkata Reddy Naidu Garu, paid his first official visit to the College and Research Institute on 28th and 29th June. The Director of Agriculture took him round the various sections of the college in each of which he spent sometime enquiring into the kind of research work carried on by each member of the staff. On 28th evening he saw the Cane Breeding and Paddy Breeding stations and on 29th morning he went round the Central Farm. The Officers' Club had arranged for a tea party in his honour and he was also present at a dinner got up by the Indian gazetted staff. A very big entertainment was arranged in his honour by the non-Brahmin Association of Coimbatore in the Variety Hall and there—outside our hearing—he paid we are glad to learn a high encomium to the staff of this college and the nature of work carried on here, this being about an answer to the vague criticisms made by some M. L. c's., in the Madras Legislative Council.

As we are writing we happen to come across a note in "Nature" referring to the Parliamentry visit to the Rothamsted station by the Minister of Agriculture, Sir Arthur Griffith—Boscawen. Accompanied by the Agricultural Committee of the House of Commons and some Lords interested in agriculture, the Cabinet Minister

visited the Rothamsted Experiment station on 13th May and the party was shown round by Lord Bledisloe and Dr. E. J. Russell, the Chairman and Director respectively of the Lawes Trust. They saw the field experiments and the laboratories. During the lunch which was arranged in honour of the visitors, the Minister of Agriculture expressed his recognition of the great importance of the work being done at Rothamsted and other Research Institutions and emphasised the fact that in such work lies one of the best hopes for Agriculture. The necessity for economy was insistent in every line of public activity, but he would see to it that, as far as it lay in his power, Agricultural Research should not be called upon to suffer in the name of a false economy. The visit of the Cabinet Minister was the first of its kind and is to be followed by periodical visits to which he will take fresh batches of M. P.s of both Houses each time.

We submit that the two are parallel and suggestive. It will take several years before Coimbatore can reach the level of Rothamsted. If old Rothamsted founded on solid lines 75 years ago is in need of sympathetic consideration at the hands of the British Cabinet Minister, young Coimbatore whose foundation cannot be said to be completely laid which is 12 or 13 years old, is certainly in need of sympathy and encouragement at the hands of the Madras Minister of Development.

We only hope that our Minister will, in the midst of his exacting duties, find time to make a number of visits, stay longer each time and bring new batches of M. L. C's with him.

We regret to learn that the Hon'ble Dewan Bahadur A. Subbarayalu Reddiar had, on considerations of health, to resign the ministership. We hope his health will improve and he will come back to active duties very soon.

It is our pleasant duty to offer our respectful congratulations to the Hon'ble Rao Bahadur A. P. Patro, one of our patrons, on his assumption of the duties of the minister for self-government. His presence should be a tower of strength to the Rural interests in the council.

We congratulate Messrs. M. R. Ramaswami Sivan, D. Ananda Rao and T. S. Venkatraman on their promotion to the Indian Agricultural Service.

Our members.

Obituary.

We record with extreme regret the tragic end through suicide on 7-8-1921 of Mr. G. A. D. Stuart the Director. He came out to India in 1902 and saw service in several districts. A more capable and hardworking officer with due sense of proportion cannot be found for the department.

Improvement of milk supply in Madras, "Milkman."

Those who can answer the following three questions have explained the present status of the Milk Supply Problem in Madras.

(1) In which hours of the day is milk available in Madras.

(2) In what quantities.

(3) and in what form.

From the experience gained during the term of his stay in Madras, the writer has found it difficult to get cow's milk pure in-

dependently after 8 A. M. or 6 P. M. Unless we have engaged a milkman on agreement to bring his cow to our doors every morning and evening and milk her before us and supply us with a definite quantity, we shall have to hunt from street to street and that before 8 A. M. till we come across a milkman who is in the act of milking his cow and even then, that milkman may say that he cannot spare us any quantity. Then we go from door to door to the milkmen's houses asking whether they have got cow's milk. The answer is invariably in the affirmative but when the milk is brought, any one with a slight experience will find out that it is buffalo's milk and water, the latter added just sufficient to give the former an appearance of cow's milk. The same story of want and worry can be repeated without alteration after 6 P. M. Motherless babes or mothers who have for some reason dried prematurely, invalids under directions to take only cow's milk unadulterated, suffer untold miseries on account of the bad system of milk supply in Madras. Another vexatious thing is that the milkmen refuse to milk their cows near our houses unless we buy a large quantity every day and all cannot afford to do. It is therefore to be concluded that we must be either rich enough to command direct supply in large quantities or go without it and satisfy ourselves, our infants and our invalids with any sort of milk adulterated with goodness knows what.

Infants and invalids, the sick and the convalescent suffer most (as they mostly depend upon milk for their daily food) if the nutritive value of the milk is unimpaired in any way i. e. either by adulteration with water, by skimming, by contamination with toxins produced by bacteria or by the presence of pathogenetic germs themselves.

Gastro-intestinal disorders arising from the administering of adulterated milk rob the country of millions of infants year after year—enshrouding millions of houses in the black pall of death and sorrow, robbing the country of its life. Therefore, proper conditions of care should be enforced upon milkmen in the matter of drawing and the handling of milk. This cannot be done in the absence of State Legislation.

In addition to these nutritive elements furnishing materials for generating heat and imparting energy to the body and for building up and repairing the physical system milk also contains a useful factor which promotes the growth of the young. On account of its highly nutritive value as a producer of heat, energy and body tissue and the quality of its being easily digested and its capacity to induce normal growth, milk is the best of all the articles of artificial foods for the infants and invalids. Nothing is perfect in the world and milk is not an exception to this rule.

It is well known that milk, when improperly handled is often the cause for generating and nursing highly infectious diseases, such as typhoid, scarlet fever, cholera, diphtheria, tuberculosis etc. and here it is that it occupies a unique position among the other food stuffs.

Milk is unfortunately a fit medium for the growth of many varieties of micro-organisms both harmless and harmful (pathogenetic to man and beast). Hence great care should be exercised in producing wholesome milk for the supply of the city.

As it stands, milk supply of Madras is in a deplorable condition and the people are depending upon the milkmen who take their cows from house to house through the dusty and infected streets and milk them mostly on the open roads. The milk drawn in this manner will not only change in composition from day to day as he only milks a portion of the milk from the cow's udder but is also liable to contamination from the dirt of the streets. In addition to this, they adulterate it with water in different proportions while milking very dexterously according to their whims. How can we expect the children to keep good health when such milk is fed to them. This is the chief reason for the infant mortality of Madras. How can this be remedied ? The Corporation and Government conjointly can remedy this state of things very easily to some extent.

The work that can be done by the Government and the Corporation of the city.

1. Corporation. Fixing cattle sheds at different centres.

2. Levying tax (license) for keeping animals (cleanliness etc).

3. (a) Insisting upon all milkmen to open shops at different places in place of the present system and to sell milk only after taking license.

(b) To separate milk into 'cow's milk and buffalos' milk.

(1) Fixing standard of milk and punishing wrongdoers by means of food inspectors as in foreign countries.

(2) *Government.*

(1) By supplying foods (cattle foods) at cheap rates.

(2) By appointing men to educate the milkmen in feeding etc., economically.

(3) By making these men to form co-operative societies for joint sale of milk and purchase of cattle food.

(4) By treating the milk, at nominal cost before issuing to public.

(5) By providing grazing grounds for the dry animals of these societies.

(6) By producing good dairy animals by crossing and selection.

(7) Periodical inspection of milk shops and their equipments by Government officials to rectify defects if there be any.

(8) Establishing model dairies and depots in certain places of the city and organising distribution depots.

(9) Prohibition of the export of the best breeds of cattle of the Presidency and getting good milk breeds from foreign countries for crossing.

Fixing Cattle sheds at different places. The cattle in Madras are not properly housed by the milkmen. As many cattle as possible are tied in a corner of the house or are cramped together in an ill-ventilated cattle yard and the dung and urine are allowed to rot in the

yard and hence in the hind quarters some animals appear to be plastered with dung which harbour myriads of microbes which may contaminate the milk at the time of drawing. In addition the rotting dung and urine in the yard provide accommodation for breeding different kinds of flies and mosquitoes which are harmful both for man and beast. However some of the milkmen wash their animals once in a day and that is not quite sufficient as the stalls and their surroundings are dirty. It becomes therefore imperative for the Corporation to take some steps (for future cattle yards at least) in insisting on the milkmen to have better yards with drains etc. or the Corporation themselves may provide some model stalls charging nominal rent from the owner for every animal. If the Corporation is prepared to provide accommodation for the cattle of the poor people it is better to have the stalls in the centre of every division or two or three divisions so that the cattle owners may themselves conveniently attend to the animals in the model stalls.

2. The Corporation will do well to insist on every man who keeps animals to take a license which will compel him to keep the animals and the stalls always clean. Stalls and animals may be inspected periodically to see that conditions of cleanliness are observed. In the case of neglect of either the stalls or animals the owner should be warned or fined in the first instance and should he persist license may be cancelled. This system will have a very good effect on the cow-herds in keeping their animals and stalls clean.

The present system of selling milk from door to door may be stopped. Even the drawing of the milk in the presence of the buyer does not escape adulteration with water by clever milkmen. To remedy this it is suggested that two or three milk depots or shops be opened in every division at convenient distances from one another. The Corporation can allot such places in every division. All the milkmen should keep their milk in the allotted place for sale. They may be permitted to sell their milk either jointly or severally. Each salesman should be made to take a permit or licence for the sale of milk. This system will create an impetus for co-operative sale among themselves. The license for milk sale from any milk depot or sheep may be given on the following conditions.

(1) That only pure milk should be sold.

(2) Buffalo's milk should be kept separate from cow's milk.

(3) That milk should be untouched by hand.

(4) That all vessels, measures etc. in which milk is dealt out should be kept scrupulously clean.

(5) Milk for sale should not be exposed but should be covered with a clean lid to prevent flies, dirt etc.

(6) Persons engaged in the handling or delivery of milk should be free from communicable diseases or from contact with such diseases. Any milk seller should be made to immediately report the presence of any such disease among his employees or in his house and failure to do so should be made criminal.

(7) The cattle from which the milk is drawn should be free from disease and should be tested by the tuberculine test at least once in a year by some veterinarian.

(8) The water supply in the premises where milk is produced and sold should be abundant and protected from contamination, ie. the water should be kept free from any disease producing germs.

(9) All vessels which come in contact with milk should be thoroughly washed and sterilised with boiling water at least, if not with steam. They should be kept protected from contamination.

(10) Milk should be sold by weight instead of by measure.

Fixing Standard of Milk. In most of the western countries the milk sold in the market is legally expected to contain the standard milk ingredients. If the seller were to adulterate the food inspectors would detect the same and send him to a court of law for punishment. The procedure adopted is as follows :—

Every food inspector will always carry a number of bottles with him and whenever he suspects a dealer of fraud he will take a sample fo the milk and fill three bottles and seal them in the latter's presence.

He will hand over one sealed bottle to the dealer and of the other two he will analyse one himself to find out the ingredients of milk and if he finds it below the standard he prosecutes the seller. The Food Inspector then summons the dealer to appear before a court of law with the sealed bottle the latter has. The Inspector then produces the third sealed bottle for prosecution. The same procedure may be adopted for Madras fixing certain standards of milk separately for cow's and buffalo's milk. This will bring any wrongdoer to book and the crime of adulteration will be minimised.

I have so far made mention only about the work to be taken up by the Corporation and now turn to the work to be undertaken by the Government.

(1) *Supply of Food stuffs for cattle to the milkmen.* The milkmen in Madras find it very difficult to get certain cattle foods like gingelly cake, wheat bran, husks and bhusa, As most of the milkmen are poor they cannot store even a week's supply when the above articles sell cheap. The milkmen of Triplicane insist on having only fresh gingelly cake for feeding their cattle. Dry cakes, they say, are not relished by cattle and interfere with the milk yield. This is a common belief among milkmen and this is a point to be decided by the Agricultural Department after experiment. But in my humble opinion whenever a change of diet is made milk yield is interfered with only temporarily, until the animal becomes accustomed to the diet, when the milk yield generally rises to the normal. But as most of the Madras milkmen solely depend upon the milk of their animals for their daily bread they cannot afford to lose the income they usually get. Therefore they cannot venture on experiments of this kind, as decrease of customers results. In some seasons (especially during the rainy season) the supply of cake is very precarious and often the milkmen go without it, for two or three days when there are constant showers and drizzles. To remedy the above state of things the Government who have already statistics of gingelly yield may purchase the seed in the harvest season and sell them to the oil-mongers of the city for being crushed with an agreement to sell the resultant cakes to the Government at certain favourable and fixed rates. Similarly they

can arrange for bhusa and dhollhusk with the mill owners of the Madras city. Wheat bran can be got from Calcutta at wholesale rates. Straw can be purchased in large quantities at the time of harvest and stocked in different localities of the city for convenient distribution. The feeding materials may be stored in a central store and distributed daily to the subdepots according to the needs of each cowowner. Thus milkmen's daily outlay of cattle food can be very appreciably reduced, whereas now the poor milkman has to pay something like a rupee for two twists of paddy straw which will be not more than 50 to 60 lbs. during the rainy season.

Another peculiarity of the milkman in Madras is that he purchases cattle foods in so many annas per day without caring for the quantity he gets. I have had experience of this for the last six months and any amount of advice does not mend his way. He says that when the cattlefoods are cheap his cattle are fortunate as they get more food and when the price goes high he will say that the animals are unfortunate. Therefore somebody should take up demonstration work to show those people that by feeding a certain ration according to the size and milk yield of an animal he can maintain the condition of the animal very well and at the same time save some money in feeding-charges. Most of the people here are under the false impression that by feeding a large quantity of gingelly cake they can increase enormously the milk yield. Some sort of demonstration by the Agricultural Department is therefore necessary in Madras city until these men understood the real state of things.

Co-operation among milkmen:—There is no co-operation at all at present among milkmen as they belong to several castes. In addition to this, on account of competition in milk trade they suspect each other. A splendid thing it will be if all joined and conducted the purchase of cattle and cattle foods, sale of milk, etc. like the western countries. With the aid of co-operation, the westerners are able to maintain pure breeds of live-stock which fetch very high prices and also manage large creamery and export large quantities of eggs and other dairy products at a considerable

profit. The prospects of improving the cattle of India by formation of co-operative societies will be much more promising than with the European nations. They can sell their milk and ghee and curds in a purer state at a cheaper rate and at the same time getting a better profit than at present. An Indian cowherd should therefore be drilled in the principles of the advantages of co-operation until it is imbibed by his poor brain. Some one should be constantly preaching these principles in time and out of time and at his very doors.

Treating milk at a nominal cost:— Before milk is distributed for consumption it should be filtered and pasteurised and cooled. But the poor milkmen cannot afford to have such a large plant to pasteurise or the patience to pass through such tedious processes. They have little or no education and cannot understand the different processes of fermentation in milk nor have they the required skill and intellect to manage the delicate and cumbersome machinery.

In addition to these on account of the non-co-operation of these milkmen it is impossible, for the supply of large quantities of milk by one or two persons. As treating small quantities of milk is neither profitable nor economical, it is imperative that the Government considering the importance of the health of the city undertake the pasteurisation of pure milk for the supply to the public. In addition to this it will also save the Corporation funds which are now spent on diseases like cholera, tuberculosis, diphtheria and enteric etc. For this purpose the Government should maintain an institution with modern equipments at least to supply pure milk and its product to Government hospitals, colleges and schools, if it is not possible to find a market from the public.

Providing grazing grounds for dry animals:— In a city like Madras the milkmen are unable to maintain at least one or two dry cows in addition to the milch cows. Because, firstly the space is insufficient in his limited house, secondly, he is unable to feed the animals with his daily earnings, thirdly, he has to pay a

tax if he keeps more than a fixed number, fourthly, he is unable to give any excercise to any of his cattle. Therefore, many of the dry cows without reaching their full productive period are mostly sent to the butcher, and thus the valuable assets of the country are lost. It may not be out of place to mention here that a cow of this type was purchased by Mr. Robertson, the late Principal of the Agricultural College, Saidapet and afterwards it proved to be one of the best milkers of the College herd. From this it is evident that the provision of grazing grounds outside the city at a nominal rental will relieve the burden to the poor milkmen. The pasture grounds may be handed over to a body of milkmen on condition that they should keep it in proper order and when it is out of order it should be taken over by the Government who should try to rectify the defects and manage the whole affair. For the admission of dry cows a nominal low rate may be fixed by the body of milkmen or by the Government themselves. This will save the lives of a lot of valuable animals every year.

Producing Good Dairy Animals by crossing & Selection:— The Madras milkmen are not aware of any methods of breeding except by crossing by foreign animals and they realise that the cross between the country and the foreign blood will increase the milk production and they will not care for the evil effects on the male progeny resulting from such a process. As a rule, there are no breeders in Madras, and very few people keep good stud bulls and charge high fees for their services. A few milkmen only resort to the good breeding bulls for getting their cows covered. On account of the indiscriminate covering the offspring naturally acquire the bad qualities of both the parents and in most cases they are useless for the purpose which they are intended for. As such the Government may take early steps by demonstrating the advantages of pure bred stock from good pedigree bulls and also to help them in grading and selecting the best from their stock. In addition to this, a number of stud animals of high quality may also

be maintained at different centres of the city for the use of these poor milkmen and at the same time animals of the undesirable breed in the city may be castrated and if private persons were to keep their own bulls they may be permitted to have them on production of a certificate from the Officers of the Department concerned, as to their soundness and fitness.

Periodical Inspection of Milk Shops:— The formation of milk shops alone as proposed in a previous para will not improve matters much. These places should be first constantly and then occasionally visited by experts to rectify defects if any and suggest necessary improvements, since illiterate milkmen are not expected to run their depots regularly if left alone.

Establishment of Model Dairies:— In order to instruct the illiterate milkmen and also to provide better stuff to the public small model dairies may be kept at some centres of the city to demonstrate the working and management of sanitary dairies. Milk dealers may be allowed to train themselves for a certain period as paid probationers before they start the opening of their milkshops and the like.

Export of Cattle:— The export of cattle from this Presidency is a drain on the milch cattle of the country. Year after year the Java Government is taking Ongole animals by special trains in large numbers both young and old from the rearing tracts in the country till it has now become very difficult to procure animals of good milking strain. The Government may even now restrict the export of cattle for at least six or seven years to come. This prohibition of export may revive the progeny of existing pure Ongole cows if any exist at all in the nooks and corners of the district.

Grape vine cultivation in Michaelpatti.

P. PONNUSWAMY NAIDU.

Asst. Agricultural Demonstrator, Dindigal

In this viillage there are about 60 gardens (under well irrigation) in which vines are grown. Most gardens grow from 5 to 30 vines. Only a few have 40 to 80 and only one garden can boast of 400 vines. Though the vine growing is considered as a very paying crop no one depends entirely upon this crop for his living as his principal.

Vine is reported to have been introduced into this place about 40 years ago by a French missionary Reverend Father Larmey and until recently its cultivation was practically confind to the Roman Catholic community of Indian Christians.

Soil and mode of cultivation.

Red loamy soil with a slight admixture of lime stone or gravel is considered best suited for grape vine cultivation. Experienced ryots say that vine grown in gravelly soil tastes sweet, but in colour is not so nice as when grown in other soils (i.e.,) grapes from Krishnagiri are nice to look at but not so luscious and sweet.

Planting.

Pits 3′ × 3′ × 3′ are dug at distances of 15 feet and filled with cattle manure and loose soil which are left to decompose for some months. Then young plants (i. e.,) fresh cuttings about 10 inches long from the healthy and vigorous plants 5 to 7 years old or young plants which have been previously cut and propagated in mud pots with soil mixed with some manure are planted.

During the first two years the intervening spaces are generally cultivated with crops like chillies, onions which require moisture and which give the tender plants necessary shade. The

young plants are placed in the pits in cool months of December and January a little after the heavy rains have ceased.

Growth.

The plants attain to a height of 4 or 5 feet when about a year old; until then sticks about 1 inch are placed by the side of the plants to support them. In the beginning of the second year the plants begin to spread when light temporary pandals are put up on which the branches creep.

Pandals.

Pandals are put up in the third year. They are of green mullukiluvai poles (Balsamodendron berryi) and are 12 feet apart. Slender agathi or pekkarumbu poles (Saccharum arudinaceum) are thrown across and fastened by aloe fibre. The mullukiluvai is chosen as it costs little, strikes root quickly, as its roots do not spread and above all as it affords nice shade to the tender creeping branches. Once in two years the agathi poles (laid across for the support of branches) are removed at the time of pruning. The pandal is about 5 feet raised from the ground level.

After cultivation.

This consists in weeding and hoeing. Hand hoeing is done at all times whenever necessary. But hoeing with mamooty is done only once in three months.

Pruning.

This is done generally twice a year. From the third year vine branches are pruned just when old leaves fall making room for new shoots to come. The first pruning is done during winter season (i. e.,) last week of December. In the third week after pruning new shoots come and by the 5th week the flowers make their full appearance. For about 10 days after pruning vines are not watered, but from the time the new shoots make their appearance vines are regularly watered on every alternate day. The vine comes to yield during the month of March and by the end of March

it is ready for harvest i. e., gathering. Then a complete rest is given from April to May. It is during this season the vine crop is being manured.

The second pruning takes place during summer season from the middle of June. Then the crop would be ready for harvest by the beginning of October. Then as usual there is a resting season ro'n the middle of October to the middle of December.

Yield.

The summer yield is generally heavy and ryots get 5 to 6 Rs. per maund. The winter yield is poor and is about less than half the summer yield and fetches 3 to 4 Rupees per maund in normal conditions. An average—sized healthy vine yields 3 maunds under best conditions in one season.

The vine falls an easy prey to attacks of mildew and other diseases. Thus the crop is lost completely. It is for this reason the ryots cultivating the grape vine are never free from great anxiety, even in spite of its otherwise very paying nature.

An ancient thief in the black-soil.

M CHINNASANI NAIDU, ASSISTANT MANAGER, HAGARI.

The thief that I now drag to the notice of the public is 'Dagadiballi in Kanarese, or DAGADITHICA' (in Telegu) in the Bellary District. This plant though not a common troublesome weed will one day become a noxious pest and is sure to invade the whole of black soil. More than this, beware! it is preparing itself perhaps a world war against the several colonies of the black-soil.

Its existence here is traced as far back as 1903. The plant is identified by the botanist as 'Cocculus Leaba.' It is a twiner or a creeper and an underground invader. It is hardy and is found

growing wild everywhere—fields, fences and bushes-- not infrequently twining round shrubs and trees. It is a perennial, gyrophytic in habit, harmless in appearence and small in size. The plant which looks so insignificant is found to send its roots as deep as to 8 to 10 feet straight down as if it were connected with the water strata below which is a belief among the ryots The root of the plant is not like that of the hariali or nutgrass, but is long and stout: often stouter than the stem itself. The plant has got a few thin lateral roots, tiny little flowers and edible berries of the size and colour of lead shot. Birds seem to be natural agencies for its spread. In short, the plant is for all appearance a harmless little thing. Its wonderful weapons viz., its hardy nature and its inherent determination to baffle all human attempt at extirpation, justify its existence and reveal to the public the widom of its Creator.

Attempts were made on the farm this year for the eradication of this weed by digging out the plant. Soil to the depth of 8 feett was dug and yet its root tip could not be seen. As such the complete removal of its root from the ground was given up as hopeless. Futher it cost nearly Rs. 15/- to dig out a dozen plants However, according to the proverb that 'Prevention is better than cure' the weed is kept under check by not being allowed to flower or fruit, but by cutting away the shoots whenever they appear above ground. In place of one shoot cut, several spring from the root which has strong reproductive vigour and which sends root-suckers from any depth below ground. Hence its complete eradication is considered an impossibility at present. It may however be possible to kill it by inoculating some poison or fungus into the plant. If it is left as it is, who knows that the weed may not spread and turn out another 'Lantana' or 'Water Hyacinth' in this country.

The leaves of the plant are used as vegetable and its wiry branches as brooms for sweeping the thrashing floor.

News and Notes.

Journal of Agricultural Research, Washington, March 1921.—Messrs. C. O. Appleman and S. V. Eaton have recorded the results of experiments on the "Evaluation of climatic Temperature Efficiency for the ripening processes in sweet corn." Green sweet corn is picked while the ripening processes are actively in progress. The corn is considered ripe when the growth of the kernel ceases and the chemical changes have attained equilibrium position and the maturing consists essentially in the loss of water and therefore the rate at which corn matures depends largely upon the climatic conditions which control evaporation. A late crop of corn required 15 days for the same period of ripening that required only 6 days for an early crop, a time ratio of 2·5.

Mr. Carl Heinrich in his article on "Some Lepidoptera likely to be confused with the "Pink Bollworm," defines the characters which distinguish the larva and pupa of the pink bollworm from those of other Lepidoptera attacking cotton and related plants or feeding on plants frequently found near cotton fields and concludes that in no instance was the pink bollworm found on any plant other than cotton.

Water supply.

The question of irrigation is of perennial interest to farmers.

Amongst the methods adopted for husbanding rainfall which is the primary source of all water, large irrigation works play an important part, but their possibilities are limited and in tracts where anicuts and reservoirs are out of the question, water that sinks into the ground is tapped and utilised to produce crops, supplementing the quantities received as rain. In this Presidency

the larger utilisation of well water in crop production attracted the attention of Mr. (now Sir) A. Chatterton about 20 years ago and his strenuous efforts were crowned with success in the increasing demand for oil engines. Wells were dug in large numbers in South Arcot and Chingleput and oil engines installed. This question has received an impetus since the Department of Industries was reorganised last year. Well irrigation is now pressed forward as a factor for mitigating famine in the oft-suffering Ganjam district. The note from the Publicity Bureau on Well Irrigation in Ganjam is, therefore, opportune and is well worth perusal. We should like however to point out that the peculiar land tenure systems in the district have been the cause of the low vitality of the Uriya and Telugu tenants, which they are gradually shaking off, and it would indeed need propaganda work of an extraordinary kind to show any appreciable progress. We suppose that the Assistant Director of Industries, Bezwada, who is responsible for the note is in full possession of information regarding the quality of underground waters in the Ganjam District and gives an authoritative opinion on their suitability to crops and their adequate supply.

Agricultural Instruction.

In an interesting note on Agricultural courses in its issue of February 12, 1921, the American Agriculturist, comments on the crowded conditions in the colleges and suggests "better less practical agriculture and more of the fundamentals" and sums up its suggestions as follows.

One thing is certain, granting students from an agricultural college would be able to express their ideas, they should have ideas to express and should have developed the capacity to interpret and understand what the farm problems are and how to solve them. This thing of having a smattering of every kind of agricultural subject defeats the object of the college and leaves the agricultural student an agricultural invalid for life.

We hold that if really educated in an agricultural college, the student by means of books and bulletins might in a week's time know as much about most practical subjects as is now acquired in a term or year occupied in the average class room. There is a great waste of time now being spent on many subjects. The student is losing because he ought to be at work on subjects that can be learned only in a laboratory and with the guidance of an expert teacher. His time however is occupied usually with work of no scholastic grade when he ought to expend his time in essential and fundamental courses

Our now very complicated courses of agriculture do not give the results of the simple courses of the olden days. They are not turning out agricultural students of big mental equipment but tending to serve on a plane no higher than mere trade information. In reform processes now going on in agriculture, reforming our college agricultural courses should have immediate consideration.

Journal of the Ministry of Agriculture March 1921.

Lieut-Col The Right Houb'le Sir Arthur Griffith-Boscawen M. P. has been appointed Minister of Agriculture and Fisheries U. K.

In England, Scotland and Wales nearly two and a half million beasts are slaughtered every year.

Two varieties of wheat have been raised by the Plant Breeding Institute at Cambridge which have carried crops of twelve quarters and over per acre without becoming lodged. The importance of this work is patent even to the dullest imagination when we consider that the average of production in England is not more than four quarters to the acre.

Soil Science:—

Willard Gardner and John A. Widstre in their article on "The Movement of Soil Moisture" observe tentatively that two assumptions have been made in the development and integration of a general equation for the movement of moisture through an ideal soil viz.,

(a) The inherent moisture conductivity in such a soil is independent of the moisture contact.

(b) The capillary potential is a lineal function of the reciprocal of the moisture contact.

M. M. McCool and L. C. Wheeting summarise in the following terms the results of some studies on the rates of formation of soluble substances in several organic soils :—

1. At any given moisture contact, the effect of a higher temperature is to increase the rate of formation of soluble material and conversely lower temperatures decrease the rate of formation.

2. For higher temperatures, optimum moisture conditions tend to bring greater amounts of material into solution than are found under saturated water condition.

3. With lower temperatures the opposite effect is observed.

4. Generally moist soils upon standing increase in concentration to a certain point after which a decline occurs, probably due to (a) reabsorption (b) chemical change to less soluble compounds or (c) biological activity.

5. Organic soils vary at different depths in the amount of soluble substances present.

6. Different depths also vary in the rate and amount of materials made soluble upon standing.

7. Below a depth of 2 feet, most soils are very inactive.

8. The surface layers usually produce the bulk of the soluble plant foods.

9. The ability to yield soluble materials decreases regularly from the surface to the water table.

10. The zone of weathering and the region of greatest activity closely coincide.

Soil Science : April 1921.

George Bouyoucos of the Michigan Agricultural Experimental Station concludes as the result of experiments made, that the amount of water which the soils are able to render unfree (for crop production) does not vary with the different moisture contents but that it appears to remain constant.

W. Rudolfs' experiments to investigate the "effect of salt solutions on absorption by seeds" show that

(a) there is a marked difference in the absorbing power of salt by different seeds. Seeds of the leguminous type show higher rates of absorption than seeds of other types. The highest absorption rates are indicated for alfalfa, the lowest for corn.

(b) the rates of absorption are progressively retarded with an increase in the osmotic concentration values of solution.

(c) the retardation of the absorption rate is accomplished through osmotic resistance offered to the water entrance into the seeds.

(d) low osmotic concentrations appear to have a stimulating influence upon absorption of seed of some species.

(e) Increasing the length of time during which the seeds are in contact with solutions has the effect of increasing the differences between the quantities absorbed.

The seeds tested were wheat, corn, watermelon, buck-wheat, Canada field peas, lupine, soybeans, rape and alfalfa.

The administration report of the Madras P. W. D. (Irrigation, for 1919—20 shows that a concession for the utilization of the water power from the Periyar lake in the Madura district was granted to Mr. A. H. Garrett in November 1919. A concession to Messrs. Tata and Sons, Limited, Bombay, for the

generation of power from the Kundah river in the Nilgiris for the supply of electrical energy to Coonoor, Ootacamund, Coimbatore and Wellington was under consideration. A special officer was employed to investigate the possible water-power sources in the Presidency. The most promising sites were reported to be Bagra in the Korapet agency and Dunduma in the Jeypore agency.

A meeting of the Indian Economic Association (Madras branch) was held on 28-4-1921 at which Mr. E. V. Sundara Reddi opened a discussion on the consolidation of agricultural holdings. All that the Government had been able to do, was, he said, to suggest that under recent settlement operations, the settlement officer might make experiments to redistribute land with the consent of the parties but that this intention had not been fulfilled. A few speakers advocated a change in the law of inheritance but Mr. Chidambaranatha Mudaliar of Tanjore who presided observed that what was really wanted was the consolidation of *landowners* rather than of landholdings. He preferred to leave things as they were at present and could not think that the division of holdings was such as to require any radical changes even by means of a permissive measure of legislation.

The Masulipatam Correspondent writes to the Hindu of the 29th April that the Government have declared the old Rajah of Chellapalli disqualified under the Court of Wards Act and have appointed his son the Kumar Rajah, a graduate and a member of the Madras Legislative Council, as the manager of the estate.

The South African Sugar Journal, Durban :—

A deputation of the Sugar planters of Natal waited on the Government at Cape Town to press the two questions of control in the future and the relationship with

Mozambique. The industry asks to be guaranteed "such a degree of stability as will enable it to carry on and to expand without fear of cutthroat competition from foreign countries which have natural advantages such as cheap labour and an annual crop as against the local biennial crop."

The next season's crop is in Natal expected to reach between 130,000 and 145,000 tons as against 142,851 tons the estimates of the past season's crop up to the end of February.

Sugar stood second among all products of the Philippine islands in 1920, rice coming first.

Sugar crop in Java is estimated for the current year at 1,420,000 to 1,550,000 long tons as compared with 1,352,000 tons in 1920.

The Italians will have to import 70 thousand tons of sugar this year as the production of beet sugar locally has been reduced one-third.

The world's sugar output this year is nearly 3 million tons short.

The Journal of Biological Chemistry, March 1921; E. W. Schulty and L. R. Chandler record the conclusions of their test on the acidity of goat's milk, cow's milk and human milk. Fresh goat's milk is more acid than fresh cow's milk, and appreciably more acid than human breast milk. Soured goat's milk is more acid than soured cow's milk. Goat's milk is usually recommended for infants and invalids in preference to cow's milk and this is due to the smaller size of the fat globules in it than in cow's or human milk thus affording a longer surface area for the action of the juices in the stomach.

The Analyst for April notes that mustard oil may be added to milk in the proportion of 20 drops per litre as a preserving agent.

The Board of Trade Journal, April 28, 1921 states that in America, a practical substitute for the Sea Island Cotton which is said to be dying out has been found in Meade Cotton a variety developed by the Department of Agriculture.

Ramasastrulu Nayudu Memorial Fund.

I beg to acknowledge with many thanks the receipt of subscriptions from the undermentioned gentlemen towards the above fund, collected up to 31st December 1920.

I shall be grateful if those that have promised subscriptions will kindly send in the same to me at an early date.

I further request those that have not yet subscribed to the above fund to kindly subscribe liberally and thus help in making the undertaking a success.

(Sd.) K. Krishnamurti Rao,
Provisional Secretary.

Ramasastrulu Nayudu Memorial Fund Collection.

Messrs.	Rs.	A.	P.	
Ananda Rao, D.	25	0	0	
Avadinayagam Pillai K.	1	0	0	
Alwa K. T.	5	0	0	
Anka Raju P.	3	0	0	
Arulanandam Pillai C.	0	8	0	
Butchi Raju.	3	0	0	
Balakrishnamurti D.	7	0	0	part payment.
Cecil Wood R.	10	0	0	
Cherian Jacob K.	1	0	0	
Chinnathambi Pillai	2	0	0	
Chelvaranga Raju J. Rao Bahadur	10	0	0	
Gopalakrishnayya	5	0	0	
Gopalarathnam.	1	0	0	part payment
Gopalakrishna Raju K.	2	0	0	
Gurusubrahmanya Ayyar K.	0	8	0	
Hilson G. R.	10	0	0	
Jogi Raju G.	10	0	0	
Krishnamurti Rao K.	5	0	0	
Kanaka Raju.	1	0	0	part payment
Kulandaswami Pillai N. S.	3	0	0	
Lakshmipathi Rao T,	5	0	0	
Lakshminarayana P.	3	0	0	
Muthuswami Ayyar V.	6	0	0	part payment
Narayana Rao T. V.	1	0	0	
Narayana Ayyar C.	1	0	0	
Narayanamurti Pantulu J.	15	0	0	
Panakala Rao D.	5	0	0	
Peri Sastri.	3	0	0	
Raghavalu Nayudu.	15	0	0	
Raman M.	2	0	0	
Ramaswami Ayyar C. V.	1	0	0	
Rangachari K. Rai Bahadur.	3	0	0	part payment.

Ramanujachari K.	2	0	0	
Ranga Reddi C.	2	0	0	part payment
Rangaswami Ayyangar G. N.	1	0	0	
Rangayya G.	5	0	0	
Ratnaji Rao,	5	0	0	
Raghavachari K.	5	0	0	
Ramachandra Rao Y. Rao Sahib.	10	0	0	
Rama Reddi P. H.	10	0	0	
Rama Rao A. Rao Sahib	5	0	0	
Sarma A. K.	3	0	0	
Sithapathy Rao.	1	0	0	part payment.
Sudarsana Raju.	3	0	0	
Subrahmanya Ayyar S.	3	0	0	
Swami Rao R.	5	0	0	
Thirumuruganatham Pillai A V.	3	0	0	
Veera Raghava Rao.	5	0	0	
Venkaswami Rao.	2	0	0	
Vencobachar	3	0	0	
Venkatrathanam P.	1	0	0	
Venkatraman T. S. Rao Sahib.	20	0	0	
Viswanath B.	10	0	0	
Venkatakrishna Mudaliar S. R.	5	0	0	
Venkata Rama Rao Bahadur (Rajah of Munagala).	100	0	0	
Total collections up to 31st December 1920 Rs.	374	0	0	
Expenses	9	0	0	
Balance	365	0	0	

K. Krishnamurti Rao.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Registered No.—M. 1155.

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THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. IX. October 1921. No. 4.

Editorial Notes.

Agriculture and the Indian Science Congress.

The First Science Congress met at Calcutta in January 1914 through the efforts of Professors MacMahon of Lucknow and Simonsen of Madras. The object and scope of this institution were, in the words of the President the Hon: Justice Sir Asutosh Mukhopadyaya, Kt. C. I. E.,

"to be similar to those of the British Association, namely, to give a stronger impulse and a more systematic direction to systematic enquiry, to promote the intercourse of societies and individuals interested in science in different parts of the country, to obtain a more general attention to the objects of pure and applied science and *the removal of any disadvantages of a public kind which may impede its progress.*"

The second Session was held at Madras in 1915. The Science Congress has since visited Lucknow, Bangalore, Lahore, Bombay, Nagpur and Calcutta. We are glad to learn it has been invited for a second time to Madras in 1922 and the meetings will take place for 5 days from January 30th. Last time at Madras, the Governor Lord Pentland deplored "that there were no papers on pure agriculture by Indian members of the congress and the papers on applied science were few and fewer still of them were offered by Indians." There have been some improvements no doubt since these words were uttered, but they are not adequate. Notable achievements have, we know, been claimed from the agricultural side. 'The most urgent branch of research work to-day is the economics of farming" We confess this aspect of investigation has not been appreciably touched in this country without which the labours of the Agricultural Departments, will, we fear, result in their being charged with manufacturing formulas inapplicable to altered conditions of time and place. We hope officers of the department will contribute an adequate number of papers to the next sittings and carry the Madras sessions a few steps forward in the progress of science not incompatible with the advancement of the country.

Our readers will remember that at its business meeting held in December last the M. A. S. Union passed a resolution that it was desirable to affiliate the agricultural College to the University and forwarded it to the Director. We are led to think that, largely owing to the commendable attitude of the late lamented Director—Mr. G. A. D. Stuart—and the sympathetic support of the Minister, the

question has been satisfactorily settled. We understand that the Senate is discussing it shortly and we hope there will be no senator against the affiliation as, in the words of Lord Carmichael "the Madrasi has a passion for University education" and think that agriculture should occupy a fitting and honourable place in the highest seats of learning, if dignity of labour is to be duly recognised and agriculture should engage the attention of the best minds in the land. Fears are expressed in some quarters that such affiliation would tend to make aspirants for the degree merely theoretical and that practice would be divorced from theory. It is hardly thinkable that the Indian student will behave differently to his confreres elsewhere in this respect and that the Agricultural College alone would ingerminate in a student a habit which he does not get in an engineering or a medical institution.

Agriculture and the University.

Co-ordination of scientific work, interchange of views between Scientists and publication of their experiences were rendered possible in England since the British Association for the Advancement of Science was founded in 1831. For 73 years agriculture contented itself with being either in the back ground or represented by scientists who were discoursing on agricultural topics without any consciousness of it or conceding it. It was at its Cambridge sessions in 1904 that agricultural subjects received separate attention and a sub-section was formed over which Dr. Somerville presided. Since then this subject has maintained a conspicuous position which was re-inforced

Agriculture and the British Association.

by conditions created by the war. This year the British Association met at Edinburgh in the second week of September last.

"Agricultural Economics" formed the subject of Mr. Orwin's Presidential Address in the Agricultural section in the course of which he said "Farming is a business and, if it is to succeed, it must be carried on with a clear regard for the economic forces which control the industry. The main concern for the farmer is to know not so much that which he can grow and how best to grow it as that which he can sell at a profit. Transport facilities determine much. The production per man employed varied with the size of the holding. The best system of farm management is that which utilises—land, labour and capital—all together so as to secure the maximum result from each. The disparity between the retail prices paid for market garden produce in big towns and the small proportions of these prices received by the growers is utterly indefensible. On the subject of agricultural costings there is much confusion of thought. This is evident in nothing perhaps so much as in connection with the valuation of the raw materials grown in the farm, hay, straw, roots, pasturage, consumed by the farm. There could be only one basis of value possible, namely their value to the farmer; yet it is contended that their market price should be substituted for the sums he has actually paid for them. As a matter of fact, the bulky feeding stuffs usually produced and consumed at home rarely have any market value at all. A market value is one that can be realised in the market. For the farmer

to regard himself as the merchant and not a manufacturer and then to trade with one department of his farm against another is to engage himself in transactions on paper which have no foundation in fact and may lead to disastrous consequences. The actual cost is the measure of the value of all raw materials."

Dr. E. T. Russell in his lecture on "Science and Crop Production" observed, "The undoubted benefit of artificials led some chemists to believe that they were at least as good as farm yard manure for ordinary use on the farm. But wider knowledge has shown that this is not the case. The Broadbalk wheat crops show less variation in yield from year to year and less variation in fertility in consequence of the use of farm yard manure. Farm yard manure never lets us down even in the worst seasons, but on the other hand it never makes record crops. Farm yard manure produces remarkable physical effects upon the soil, improving the air and water supply, lightening the work of the village implements and improving the tilth. Farm yard manure and green manure put into the soil are not really agents of fertility but only raw materials out of which fertility is manufactured." Incidentally he referred to the manufacture of artificial farm yard manure from straw on which a note appears in this issue.

A Plea.

We invite our readers' kind attention to a letter from Veritas' which speaks for itself. We understand that the Madras Agricultural Students' Union Council has taken action already. For their vigorous plea on behalf of the staff on Demonstration work grateful thanks are tendered to the Sugar Committee.

The older I grow.

The older I grow the more patient I am,
And fonder of people I seem to become;
I find much that's real hidden deep in the sham,
I know that life's juices are under the scum,
The cares that once fretted as trifles appear,
And the faults that loomed large in friends that I know,
Seem to fade in a background of kindness and cheer,
The older I grow.
Time was that I questioned the purpose of life,
In the mad way of youth I was quick with my hate,
But I knew not the depth nor the breadth of the strife,
And I knew nothing then of the workings of fate.
I judged from the surface and not from the deep,
I was wasteful with pleasure and fearful of woe,
But I find that my joys I'm more eager to keep,
The older I grow.
I chose all my friends with particular care,
Heedlessly wounded the truest and best;
To many false Gods I sent up a prayer,
Then real things of life seemed a subject for jest.
And the bad seemed the good and the good seemed the bad,
I scorned in my haste what was splendid below;
But I find myself longing to have what I had,
The older I grow.
I have learned that men's follies are not printed deep,
That things youth mocks at are splendid and fine,
And young people scatter the joys they should keep,
In the very same way that I once wasted mine.
I'm more tolerant now, I am slower to sneer,
For I've suffered my grief's and I've winced at a blow;
And money I find matters less and less here
The older I grow. *(Selected)*

American Agriculturist, May 21, 1921.

'Nolla' a levelling implement in Narasapatam Taluk, Vizagapatam District.

A. Venkobachar, Asst. Manager, Hagari.

This simple implement is entirely made of wood chiefly babool which is within the easy reach of an ordinary ryot.

It consists of a wooden shaft pole with two arms diverging from one end in the shape of "V." Towards the end of each of these arms there is a hole and into these holes a wooden plank is loosely fitted by its projections on either side. The edge of the free end of the plank is sharp, for it is intended to scrape the earth. A cross rod s fixed between the two arms so that it might prevent the handle from touching the ground when it is let fall forwards. This implement is light and is worked with one pair of animals of these parts which are poor in condition and stunted. The work turned out is more than is possible with manual labour.

This can be used for levelling the land both in the dry and in the puddled state before planting paddy. This is also used for raising big bunds all round the fields reclaimed for paddy cultivation—a practice commonly followed in these parts.

The land to be levelled is first stirred well by ploughing. Then "Nolla" is passed from a higher to a lower level. While passing it from a higher level the wooden plank is held by the handle inclined towards the shaft, so that the sharpened edge of the plank might scrape the soil and carry the earth with it. When the lowest level is reached, the handle is let forward and it leans upon the cross rod and all the earth is dumped in the low-level-ground. This implement does not require much repairing and if it goes wrong, it is not beyond the skill of the village carpenter to repair it. To increase its efficiency and reduce wear and tear, the plank can be provided with an iron edge Work done with the implement is compared below:—For a lead of 50 yards for carrying earth, time taken by the animals to draw the implement to and fro is two minutes. Each time the implement removes 5 baskets of earth. This works out as follows:—

For 2 minutes, 5 baskets

,, 8 hours, 5/2 × 480 equal to 1200 baskets.

Taking that one cartload is equal to 50 baskets, this works out to 24 cartloads a day.

We shall see how this compares with work turned out by manual labour.

"2 men and 6 women" is a convenient minimum for digging earth, carrying and spreading.

1 man to dig and fill the basket at 5 annas a day.

1 woman to lift the basket at 2½ annas a day.

5 women to carry.

1 man to receive the basket and spread the earth

2 minutes may be roughly taken as the time required for each woman to carry the earth with a lead of fifty yards and return.

Thus in 2 minutes 1 woman carries 1 basket.

,, 8 hours, 5 women, 8 × 60/2 × 5 equal to 1200 baskets or 24 cartloads.

The cost of removing 24 cartloads of earth by manual labour comes to Rs. 1—9—0. But the expenditure incurred by working with "Nolla" comes to only 2 annas for 24 cartloads. The cost of ploughing before levelling may be left out of account as that operation is necessary in both cases to facilitate rapid work.

In Coimbatore Farm levelling operation is done by an implement called "Buck Scraper." This is an improvement over the indigenous implement. The difference between the "Nolla" and the "Buck Scraper" lies in the fact that the latter is provided with an open box to hold a larger quantity of earth which of course demands more draft power, whereas in the former, there is flat surface to hold the earth. Cheapness, simplicity, little need of repairs, are points really in favour of this time-honoured implement.

Review.

The 1920—21 year book of the Madras Agricultural Department just published contains useful articles. Crop pests and diseases occupy a fair amount of attention. In "Sugarcane in South Kanara" are described the different stages through which the cane cultivation has passed in that picturesque but oft forgotten district of this Presidency. It is refreshing to note that in parts where there were professional jaggery makers it was easier for the department to work through them than to deal with the tenants directly. "Livestock of the Farm" and "Some temperature experiments in Butter making" give information which are instructive to people concerned with milk. Very suggestive though tentative results due to variations in the treatment of seedbeds are recorded in "Effect of quality of seedlings on yield of paddy" "Note on the trials of Nitrolim" summarises the inconclusive results obtained by the application of this new fertilizer to four important cereal crops of this Province, namely, paddy, cholam, ragi and tenai. "Analyses of varieties of Rice" indicates the marked differences in the nutritive ratios found in the samples furnished by the Deputy Director of Agriculture, Cocanada. It is noted that the largest percentage of crude Protein and consequently a bigger nutritive ratio are scored by Garikisannavari, Swarnalu and Poombalai —varieties to which consumers do not accord a high place. Amateur cane growers will derive much benefit from a perusal of the article on "Irrigation water for sugarcane cultivation" where the warning is given that anything over 75 parts of common salt in water is not desirable and its evil effects persist for a long time even to the unprofitable extent of rendering raw sugar unsolidifiable, besides probably impairing "the physical condition of the soil as well." "The Mango in Alamanda" is a very descriptive study of this delicious fruit and its cultivation in one of the most favoured tracts of the Telugu ditricts.

The tour Mr. Sampson made last year, in Cochin China, Cambodia, F. M S and Ceylon is the subject of a lengthy contribution. To the people of South India especially, this account is really flattering in that one more instance is added of the glory of their ancient civilization which spread to these lands. It is unfortunate that unsuitability of the season prevented him from gathering firsthand information on all agricultural crops but his detailed accounts of the pepper cultivation and his discriminative observations on the coconut plantations in F. M. S. are such that full justice cannot be done in a monthly magazine like ours.

Agricultural Education in Denmark.

A SUMMARY.

Mr. A. E. Harris, a member of the agricultural expedition that under the auspices of the English Ministry of Agriculture spent a month in Denmark from June 25th to July 25, 1920, writes an informing article under the above heading in the Journal of the Royal Agricultural Society of England.

Mr. Harris says that, as compared with England, Denmark is a land of the small farmers. A sixth of the land is in holdings of less than 35 acres and two-thirds is in holdings of less than 150 acres Since the beginning of this century the state has encouraged the establishment of small farms by issuing cheap loans and since 1900 more than £ 3,000,000 have been granted as direct loans, practically all the farms now being freehold. They are worked in many cases solely by the farmer and his family. Although 90 per cent of the land —5 million acres—is under arable cultivation, the agriculture of the country is founded on cows. There are 46 cows per 100 head of population as compared with 10 cows per 100 head of population in England and Wales (and 13 cows per 100 head of population in the Madras Presidency—Ed.]. The milk

is sent to creameries to be made into butter or cheese for export. The scheme of agricultural education therefore is based on the economic conditions of the country. Denmark is essentially an agricultural country and the writer expected to find a strong agricultural bias in the teaching in Elementary Schools. In this however he was disappointed. Education is compulsory up to the age of 14, but there is very little Nature Study included in the curriculum aud it is exceptional to find School Gardens attached to the Schools.

In villages boys and girls are taught in the same classes. A full school day varies from 6 working hours for older children to 4 hours for the youngest children. In the "Islands" it is usual for each class to attend school every day. Elderly children attend more days in winter and younger, more days in summer. Every class receives instruction for 41 weeks averaging 18 hours a week.

The High Schools educate children up to their eighteenth year and the pupils can choose between classics, mathematics or modern languages Scholars who pass are qualified to enter the University at Copenhagen.

There are nearly 30 agricultural schools all privately owned. All students are required to have had at least 3 years' practical experience on a farm before attending an agricultural school. They are expected to have had a good general education and the teaching is entirely confined to the sciences connected with agriculture. One such school is located at Dalum. There are about 100 acres of land attached to the school which are farmed solely for profit and students do no practical work on the farm

There are two main courses of instruction given (1) the agricultural course (2) the dairying course. The agricultural course extends over a period of six months. Students put in seven hours a day.

The Dairy course is one of eight months' duration (from October to May). No practical instruction is given in butter or cheese making. Scholars are expected to know that part of the work before coming to the school. In both the agricultural and dairying courses one hour in every four is devoted to questions and answers in different subjects.

The best students from an agricultural school pass on to the Royal Agricultural College at Copenhagen.

This is a non-residential college and has no farm attached to it.

The students who take the agricultural course are sons of farmers. Those who fail in the examination return to the farms and those who are successful obtain posts as teachers, lecturers or experts.

There are six agricultural experiment stations belonging to the state, the administration of each is vested in a state committee of 5 elected members.

Each station is under the charge of a Director. At all stations the size of the experimental field is always very small, usually only 30 square yards and each plot is duplicated at least six times. In Aarslev for example there are no fewer than 2976 different plots on 85 acres of land.

The experiments with farmyard manure are interesting. The food fed to each cow is weighed and analysed and the comparative analyses of droppings from each cow detect any abnormal cows. Special pits one for each cow have been made in concrete 3½' × 4' × 6' to receive the manure and the liquid manure is stored in an air-tight tank underneath. The contents of each pit are applied to separate plots of land.

There are over 130 local agricultural societies which are amalgamated through Provincial societies into one Associated Agricultural Society. These societies do very good work. The number

of field trials has been annually increasing. A recent development of their work has been cost accounting. The accounts of 235 arms were analysed in 17—18 and of 312, in 18—19.

The results are tabulated below.

	Below 25 acres	25 to 50	50 to 75	75 to 125	125 to 250	over 250.
No. of Farm.	14—24	42—51	68—78	70—95	29—33	12—12.
Average size in acres.	17—16·3	37.. —39·3	63·2—6·12	95—94·8	168·5—168·3	467·7—501
Capital per acre	£ 58	61	54	55	56	56 53 50 48 50 47 45.
Gross profit	16-18	25-4	16-15	20-7	16-10	19-12 15-12 17-18 14-5 1816 14 15-19.
Expenses including farmer's labour	13·10	18·7	11	11	13	1 11 7 12·12 10·8 11·5 9·15 10·11 9·14 9·11.
Net profits	3-8	6-17	5-4	7-6	5-3	7-0 5-4 6-13 4-10 6-5 4-6 6-5

News and Notes.

Cotton Stalks and Paper pulp.

As cotton is grown on large areas in India, what the Popular Science Monthly says of a new use of cotton stalks ought to enable the Indian capitalist to make money. It says:—

"There is now a pulp mill in Greenwood, Mississippi, that turns out one hundred and fifty tons of cotton stalks into 50 tons of valuable paper-pulp every day. A careful analysis of the cotton plant has led to the discovery that a certain thin tubular fibre in the plant will make excellent cellulose for durable papers. It is strong and flexible.

If a quarter of the annual supply of the cotton stalks of the South were put to this use each year, there would be no fear of paper shortage in this country."

This short extract from the Modern Review for October 1920 reminds me of another note in the Hindu of the 12th February 1917, wherein it was stated that experiments on a laboratory scale were made by the Government Agricultural Chemist of the Agricultural

Research Institute, Nagpur, to determine the details of the process and nature of the product obtained. Analysis of cotton stalks was made and they were found to contain 42·4% cellulose, 10·3% moisture, 15·8% mineral. After describing the method employed in the preparation of paper pulp, the report states that samples were made which went to show that paper could be prepared from cotton stalks. The Governments of Bengal and Burma are said to be making efforts to extend paper production in India.

Now it is three years and over, since that extract appeared and experiments were conducted by the Nagpur Agricultural Chemist.

It is not known what furthur experiments were made and what were their results.

India produces large quantities of cotton year after year and the stalks go to supply the fuel needs of the people and the ashes therefrom are returned to the manure pit. Of course from an agricultural point of view it is really a gratification to see that what is removed from the soil is being returned to it, first by the goats browsing and the return of the ingredients in the shape of the droppings and secondly in the shape of ashes. Thus the time—worn practice of goat—browsing prior to pulling out cotton stalks and that of returning ashes to the manure pit, and finally to the fields is to be really commended. Besides the return of the ingredients to the soil, the ryots get their minor needs by using cotton stalks for baskets, side protection for the carts, for fodder trough, muzzles for cattle and so on.

Thus the extension of paper pulp manufacture out of cotton stalks will have to be considered well before being so done on any extensive scale, since the same will really create certain drain on the fertility of the land and a tendency for the ryots to sell away cotton stalks for paper pulp, and go in for purchase of firewood which in turn will demand a heavier toll on the forests. But if it is finally proved that conversion of cotton stalks into paper pulp is

more profitable, surely the money obtained therefrom may be spent in the purchase of fertilizers for their crops and balance of fertility kept up.

A. K. G.

It is a matter for congratulation that in the hamlet of Kalipalayam, Samalapuram Village, Palladam Taluk, excellent work is being carried on in the breeding of buffaloes. There are about eight stud-buffaloes in this village maintained purely for breeding purposes for the last 3 or 4 generations by a class of people known as Woddars (brick layers). There are good dry uplands in this hamlet and quarrying for rough jelly-stone is their main profession. They rear the buffaloes as their secondary occupation. A large number of she-buffaloes from all the neighbouring hamlets is brought to service just three days before and after the full and new moon days. There is no fixed charge for service and the rate varies from 6 to 12 annas per service.

P. V. H.

E. M. East and D. F. Jones in their article on "Protein content of Maize" observe that merely as a matter of probability it would be more difficult to secure a high proportion of certain ingredients together with high yield than it would be to secure either alone. The truth is that inbred strains showing the highest protein percentage are weak and unproductive. As a rule high protein strains are less vigorous than strains not so selected and crosses between them generally give lower yields than other crosses. It may well be therefore that high protein maize can be secured only at the expense of maximum total production."

(Genetics, November, 1920)

Artificial farmyard manure:—

When cattle are fed with food rich in Nitrogen, their excrement considered on a chemical basis, is correspondingly enriched and cake fed dung has been given a high value by the man of

science and also by the farmer, so much so that Hall and Voelcker have published Tables giving residual manurial values of food stuffs. The perplexing fact remained, however, that dung with this higher theoretical value did not give crop increases proportionate to their chemical content. Hutchinson and Richards of the Rothamsted station indicate the solution of the conundrum in their paper published in the August number of the journal of the Ministry of Agriculture. They have proved that the whole of the nitrogen in the urine of animals will not be present in the manure as applied to crops, unless a certain ratio subsists between the nitrogen voided by the animals and the carbonaceous matter of the litter which absorbs the urine. They show that the factors involved are mainly biological and not chemical The making of farmyard manure is essentially the fermentation of straw brought about by a new *aeroluc* organism *sphirochaeta cytophaga* which requires oxygen, and nitrogen in the form of ammonia or urea 100 lbs. of straw require 0·72 lb. of such nitrogen. If the nitrogen is in excess,, it passes into the air as ammonia or picked by those of the manure where the proportion is less, until in all cases the whole heap reacts the characteristic and uniform 2% nitrogen.

This result has been utilised to prepare an artificial product, resembling farmyard manure in appearance and properties by adding calculated quantity of ammonium salts to straw. The advent of the motor has resulted in less farm animals being maintained, less straw being utilised and farmyard manure being porduced. The new artificial manure will supply the need, when manures containing humus are required It has a so been shown that, if liquid sewage is used to ferment the straw, the effluent is practically free from nitrogen and the straw has retained all the nitrogen.

The above discovery is a notable scientific advance and makes another stage in the capture by the biologists of the field of agricultural research (From Nature 25 August 1921.) M. R. R.

Java and British India as sugar producers.

The Dutch East Indies remain as a fraction of that great empire that the Dutch controlled more than three hundred years ago, reaching from the East Indies to the West Indies, from New Amsterdam, or New York, north of the equator, to New Zealand south of the equator. The Dutch seem to make friends of the natives wherever they have settled and the Dutch East Indies now have possibilities in the way of development that we, or they may scarcely have dreamed of. The great island of Borneo is one of their possessions and may be to the Dutch a source of immense wealth. Java, Sumatra and the Spice Islands have been the chief centre of Dutch activities in the Far East and it doubtless came as somewhat of a shock to the more slowly—moving Spaniards some thirty years ago, when they found that the Dutch island of Java was producing more sugar than the Spanish island of Cuba. Under American domination, Cuba of course has practically outdone itself and has become the chief centre of cane production of the world and has the capacity for retaining that position. Java's resources in cane sugar are certainly unknown even to the Dutch themselves but they have produced in Java some 1,700,0 0 or 1,900,000 tons of sugar in a single year and that had never been done in Cuba, and not even approached in Cuba until after the American domination there.

The utilisation of the vast population of the British East Indies where they have thousands of natives to the square mile, will give Great Britain the opportunity of utilising that vast mass of human labour and the vast areas of sugar cane producing land, but it may take many years to bring these results about. The germ has been planted, the possibilities have been considered and efforts are now being made and plans are being prepared that, it is hoped, will lead to the development of a genuine commercial sugar industry in British India that will exhibit to the rest of the world

a conspicuity that in cane sugar is now only enjoyed by Cuba, and a conspicuity similar to that of the great plains of central Europe which for thousands of years supplied wheat and other cereals to nearly all the nations of the world all that time. British India, with the people on the spot and with available capital. as soon as it gets over the shock of the recent war, may and will open up the gates of the East in due course, and send a flood of cane sugar into the western world.

(Abstract from page 114 last para of the Louisiana Planter and sugar manufacturer dated August 20, 1921, Vol. LXVVI.)

T. S. V.

Students' Corner.

The college met first the Stanes European High School, the winners of last year, on Mr. Narasiah's compound. The school took first tenancy at the wicket on winning the toss but being unable to withstand the attack of Hegde, who was in charge of the leather on the college side, were all dismissed for a small total of 84 runs. The college replied with 200 and K. T. Bhandary exhibited a lively game for his 55.

The next fixture was against the Coimbatore European club, In their first venture they were all disposed of for a meagre total of 55 runs. Mr. Anstead monopolised the bowling honours. The College also put in a poor total of 103; Hegde with his 32 was the principal contributor. The final match came off on the 22nd October against the Coimbatore United Club. The College on winning the toss curiously enough put their opponents in. This unusual move was intelligible to me only after the match had come to a finish. They were evidently out to give them an innings defeat and in this attempt they succeeded. The United Club fared no better than its predecessors, their contribution with

first innings all told reached 54. For the College, Doraisamy with clever change of pace and pitch kept in check the hitting propensities of the opponents and captured 6 wickets for only 25 runs. The college piled up 143 runs mainly through the efforts of Venkataramanan who played an excellent innings of 55. In the next attempt the union fared worse; Mr. Anstead who bagged 6 wickets conceding 19 runs, chiefly being responsible for their poor exhibition.

Letter.

To The Editor,

Madras Agricultural Students' Union.

Sir,

I send herewith an extract from the Sugar Committee report. Don't you think, dear editor, that the present difference in pay between a demonstrator and a scientific subordinate is rather invidious—There are cases where a medalist or a first class Diplomat gets only Rs. 70 as a Demonstrator or Farm Manager while the 3rd or 4th of the same set of students is started on Rs. 100 as a scientific assistant. It would certainly damp the enthusiasm of the Demonstrator, if things continue as at present. Please bring this to the notice of the wider public and try to remedy the defect.

"VERITAS."

Extract from "Report of the Indian Sugar Committee" page 370.

It would be idle to deny the existence in some quarters of the Agricultural Service at least of an impression that demonstration work is of a definitely inferior order to research work. And we are profoundly convinced that the object of spreading agricultural improvements will not be realised as fully as it ought to be realised so long as demonstration is not given the recognition and the esteem it deserves. Demonstration is not the handmaid of research, but its full and equal partner. It is hardly an exaggeration to say that research without demonstration is as useless to Indian Agriculture as demonstration without research. It is not, perhaps, surprising that the Agricultural officer, fresh from his studies in whatever branch of scientific

agriculture, should sometimes betray a predisposition to see in the laboratory and the research station, in the publication of treatises and the commendation of fellow scientists, the whole future and aim of his life's work in India. It is a defect of his training for which, his subsequent experience must provide the remedy, for experience will show him that with the achievement of the most definite results on the Government farm the problem of improving Indian Agriculture has only begun. The task of disseminating those results calls for a concentration undistracted by other labours and for attainments and qualities of the highest order. Demonstration requires its full share of the best men in the department; and it has work to give them in every way worthy of their abilities. It offers constant opportunity both for the use and the enlargement of their scientific knowledge in the observation of existing agricultural conditions and practice and in detecting loaal variations and behaviour and result upon the conclusions established at the research stations. For the enthusiasm and practice which always imbue the true scientist they will find no less scope in touch with the realities of Indian rural life than they found in pure research ; while human sympathy and understanding will be required of them in greater measusre than before. There is thus no valid ground for holding that, if the functions of research and demonstration are separated in the interests of efficiency, any invidious distinction will be involved. Each is in the same degree essential to the solution of the great problem of promoting the ryot's prosperity ; each is in the same degree dependent on the other for assistance to that end.

Ramasastrulu Nayudu Memorial Fund.

Gentlemen who have subscribed to the Fund will be glad to know that about Rs. 450 has been collected. It is proposed to finally settle the form of the Memorial on the occasion of the next College day.

Those who cannot be present are requested to communicate their wishes. It is tentatively suggested that the interest on the amount may be utilised in giving pecuniary or other help to any agricultural student from the present submerged classes.

(Sd). K. Krishnamurthi Rao,
Provisional Secretary.

M. A S. Union Building Fund.

Gentlemen who have promised are requested to remit the amounts. Those whom the appeal has not reached but who are interested in the Union are also invited to help.

(Sd.) K. T Bhandary.

Departmental Notes.

Appointments and Transfer:—

Mr. B. S. Narasimha Ayyar, Sub-Assistant, Government Agricultural Bacteriologist's section, to be assistant in that section on Rs. 100-5-150 on probation. To take effect from the 11th October 1921.

Mr. K. Narayana Ayyangar, Farm Manager, Anakapalli to be Farm Manager, in charge, Koilpatti Farm, vice Mr. S. Narayana Ayyar, granted leave. To join on the expiry of his privilege leave for three months from 25th July 1921.

The following officers are confirmed in their appointment:—

1. Mr. R. Narasimha Ayyar.
2. Mr. P. S. Suryanarayana Aiyar.

Leave :—

Mr. K. K. Subramania Iyer, Agricultural Demonstrator Gobichettipalayam privilege leave for 17 days from 23rd September 21 to 9th October 21.

Mr. A. Gopalakrishna Ayya, Farm Manager Chintaladevi, 16 days privilege leave from 20th September 21. Compensation leave is cancelled.

Mr. Ramachandra Naidu, Assistant Agricultural Demonstrator, Avanashi privilege leave from 4th to 19th October 1921.

Mr. K. Vasudeva Shenoi, Assistant Demonstrator, three weeks' privilege leave from 1st October 1921.

Mr. P. Janakirama Ayyar, Assistant Agricultural Demonstrator, privilege leave for ten days and furlough on half pay for one month and 20 days in continuation of the privilege leave already granted.

Mr. A. Sachithanandam Iyer, Farm Mechanic, Anamali, Agricultural Station, Anamalai, privilege leave for 28 days from 4th September 1921.

Mr K. Unni Krishna Menon, Agricultural Demonstrator, pvivilege leave for three months from date of relief.

Mr. R. Subrahmanyam, Assistant Agricultural Demonstrator, leave on medical certificate from 11th Sep. 21 to 21st October 21 both days inclusive.

Mr. N. Sadagopa Acharya, Farm Manager, Palur, with effect from 1st September 21, privilege leave for 18 days and furlough for 4 days on half pay in continuation thereof.

Mr. K. K. Subrahmanya Iyer, Agricultural Demonstrator, extension of privilege for 24 days in continuation of the privilege leave already granted to him for 17 days from the 24th September 21.

Mr. M. Raghavulu Nayudu, Agricultural Demonstrator, is granted privilege leave for four months from or after 1st November 21.

Mr. T. V. Subrahmanya Iyer, Assistant in Entomology, extension of privilege leave for 16 days, in continuation of the two months' leave already granted.

Mr. A. K. Subrahmanya Iyer, Supervisor, privilege leave for one month from date of relief.

Mr. P. Susainathan, Assistant in Entomology, is granted privilege leave for 45 days from the 9th November 21, with permission to suffix the Christ holidays under article 220, C. S. R.

Resignation:—

Mr. N. Ananthanarayanan, Assistant in Chemistry.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

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THE JOURNAL

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Vol. IX. **November 1921.** **No. 5.**

Editorial Notes.

Indian Sugar Committee Report.

The Report has been published of this Committee which was appointed by the Government of India in October 1919. The Committee visited all important Provinces in India and spent a month in Java—the sugar store-house for India. That this country should annually import about 800,000 tons of sugar is a matter of serious concern both for her and other sugar—consuming countries of the world. That her present acre-yield of 1·07 tons can be increased there is no manner of doubt. The Committee examined witnesses in detail and has submitted its conclusions and recommendations relative to each province separately. This is eminently satisfactory, as in a vast country like India the several provinces vary considerably in climatic and other conditions.

The Committee has rightly come to the main conclusions that extension of area under sugarcane is not possible except in the undeveloped provinces—Assam and the N. W. F. Province and improvement is possible on the industrial side. The committee's account of the cultivation and manufacture of cane sugar in Java is interesting and unravels the mystery about her methods. We are told that "as the result of the traditions of forced culture system, the Java sugar industry has had exceptional advantages."

The Committee recommended in respect of Madras that agricultural farms should operate in the four sugarcane tracts.

The opening of a Sugar School in Upper India is a proposal to which few can demur.

We hope and believe that the labours of the committee will bear fruit and its proposals, materialise in the shortest time possible so that this country may, with its abundant natural resources, become self-contained once again.

Indian Sugar Students.

We learn from the 'Louisiana Planter' for October 29, 1921, that 3 Indians,—G. N. Annayya, G. P. Uplap and R. C. Padhye, graduates of the leading local universities—have been sent by the Government of India to the Louisiana State University to learn sugar business. We very much wish that these young men had been sent to Cuba or Java—the two foremost countries for sugar production at present

Louisiana is about 10,000 miles away and has, owing to its peculiar conditions, not been able to increase its sugar output even during the over-stimulating war-period.

Our Members

We are happy to learn that Messers. D. Balakrishnamurthi, S. Sundararaman and G. N. Rangaswami Aiyangar have been admitted into the Indian Agricultural Service, and tender our hearty congratulations to them.

Agriculture in a Tinnevelly Village.

P. R. SUBRAMANIYA AYYAR, ASSISTANT FARM MANAGER, KOILPATTI.

Nalattinputtur is a big village about 5 miles south-west of Koilpatti. It boasts of a post office, a board primary school and a co-operative credit society. Messers. Ralli and Volkart Brothers have flourishing cotton agencies here. The Kammavars, the Konars and the Thevars form the chief agricultural classes.

Soils. The arable lands comprise an area of 6,000 acres, of which nearly 4,000 are typical black, and the remainder, red-soils. Here the black soil is the best of its kind and the Red soil is differentiated by the two names, *Eri-sevval* (Red Loam) and—*Manal sevval*—(Red Sand.) The latter kind of soil is met with at the foot of 'bare' rocky eminences situated in the south western portion of the village. The productive layer—*Manal sevval*—is however very thin. Major portion of this area is cultivated dry. There are small areas under wells.

Rainfall and the Sowing seasons. The main sowing season commences here with the setting in of the North-East Monsoon i. e. from the closing days of September to the end of October. During this period the staple cereal of this tract—cambu—and the most important

commercial crop—cotton—are sown. In the red soils if a sowing rain is received, cholam is sown in Purattasipattam (September 15th to 25th) and Red gram, in Anipattam, (i. e. in the middle of June.)

Agricultural Practices. (a) Implements. These are (1) the common wooden plough, (2) the hoe for weeding, (3) the crowbar for breaking up black soils, principally for digging out hariali, (4) the sickle for harvesting (5) Kapparakkatti (a small sickle) for harvesting ear heads (6) the mammutti and above all the gorru (the two tined drill) and guntaka are also found in fair numbers.

(*b*) *Fallowing.* Lands are regularly fallowed, usually ploughed with the rains of April and May in the red soils. Keeping the land fallow after ploughing is common in this tract. Generally in the black soils the land is ploughed and fallowed after the harvest of cambu and Nathu (Fodder cholam). The obvious advantages of this practice are very well appreciated by the ryots. Experience has crystallised into the proverb "Speed the Kar plough."

(*c*) *Ploughing.* There is nothing noteworthy to write under this head except the old country plough is invariably used. The ryots here do not plough the lands by turning down the stubbles. On account of fuel scarcity the stubbles, especially of cholam, are carefully collected and stacked. Such heaps form a common feature in this village.

Another important point may also be added. In the wet lands immediately after harvest the land is ploughed in puddled condition and green manure applied and allowed to remain so till April and May rains when summer plougings are given.

Manures. The value of farm yard manure is appreciated here. People do not utilize the manure for making bratties. Here the same amount of care observed in Thittangulam in the preservation of farm yard manure is not taken. Uncovered heaps of farm yard manure are very common.

Green leaf Manure. The practice of growing green manures directly for manuring though not unknown, is not carried out. The

chief green leaf manure used here is that of *Cassia Auriculata* (Avarai) Well-to-do pattadars take annual leases of sirkar peramboke lands adjoining the roadway and cut and utilise the cassia leaves grown wild here. The lease amount varies from Rs. 3 to 5 per mile along the road on both sides.

Mineral Manures. The chief mineral manures used are potash earth. This is used for top-dressing tobacco plants. Tank silt is carted and applied to red soils to make them more retentive. Black soils are improved by adding red earth when found too stiff for garden cultivation.

Other Important Manures. Pig manure is very much utilised in paddy lands and there is a great demand for this in connection with the plantain cultivation. The local supply cannot meet the demand so much so that ryots go to Sattur and cart manure at 16 Rs. per cart load ex-cart hire.

Sheep Penning. Shepherds are tending sheep as a profession. In this village there are about 5,000 sheep. They are calculated as so many 'mois' which is a very convenient number. It may be from 25 up to 50 sheep. For one acre to be manured 1,000 sheep are penned for a single night. The cost is either paid in kind or in money. Rs. 10 every night is the average cost for 1000 sheep or the grain equivalent according to the current prices is given. In addition to this, the owner of the land pays watching fees which are nominal and amount to Re. 1 per day. For a flock of 120 sheep, 4 shepherd boys are necessary for tending. They are paid Rs. 25 per year, with meals. They are provided with clothing and sandals. Their chief duties are as follows :—

(1) To gather babool pods
(2) To shear wool before the rains set in
(3) To tend the young sheep
(4) To see that the sheep do not go astray

They say that sheep tending is more paying than being a day labourer or a farm servant. They realise profits under these heads,

(1) By selling young sheep
(2) by disposing of old sheep and the most important item is
(3) sheep penning.

There may be some casualties on account of some diseases but yet they find it paying.

Rotation. The following rotations are followed here.

Black Soil. Cambu is rotated with cotton;
cholam fodder or nathu is rotated with cotton;
in fields where Bengal gram is sown
Bengal gram is followed by cotton.

In black cotton soil, certain portion is reserved for what is known as *kambadi*, where people by intense manuring grow cambu without any rotation.

Red Soil. One rotation in the red soil. Red gram is followed by a cereal. There is no regular rotation here in the red soils. Cereal (usually sown as a mixture with a pulse crop), fallow for a season and then again a cereal is the usual scheme for cropping.

Garden lands. This is the rotation in garden lands.

Vellai cholam followed by Ragi, which is followed by Tobacco in stubbles, the previous ragi crop being heavily manured. This is the rotation followed usually in Coimbatore.

Seeds and Sowing. Some care is taken in the selection of cotton seeds. Usually the seeds from season picking are reserved for sowing. The old karunganni has completely disappeared. The new improved strains have supplanted old karunganni. Company 2, Co. 3, A—1 and A—2 and so on are the prevailing jargon pertaining to cotton seeds.

Quantities of seed. The seed rate used is often extravagant. Some 150 lbs. of seed are used in Chola Nathu. In paddy cultivation as it is usually done here, under dry or partially dry condition the seed rate is as follows.

48 Madras measures per acre.

In cotton 8 Madras measures, usually mixed with ¾ Madras measure of coriander and ¾ Madras measure of black gram.

In Bengal gram a seed rate of 30 Madras measures is used.

Methods of Sowing. The usual methods of sowing carried here are (1) Broad-casting (2) dibbling behind a country plough, and (3) drilling. Paddy is usually sown broadcast. No nurseries are being raised.

Mixed Crops. The usual mixtures in the black soil are :—

(1) Cotton mixed with Tenai.

(2) Cotton mixed with coriander and black gram. The black gram is dibbled in furrows 8 feet apart.

In the Red Soil. The only mixture is Cholam mixed with Thattappayaru.—Cow-pea.

In the absence of cholam, usually any cereal is mixed with a pulse and sown broadcast.

Deccan Hemp—Hibiscus Cannabinus is grown along the bunds in garden lands.

After cultivation. In red soils, hoeing, weeding and thinning are given. In black soils especially the cotton crop receives good after-cultivation. The tools used are (1) a sharpened stick (2) Sedakkiti. (1) Kuchikilai (2) Sedukkikilai (3) Vettukilai are the suggestive names given to the successive hoeings done to the cotton crop.

Agricultural Labour. Kammars, Konars and Maravars form the chief labouring class. Owing to the proximity of Koilpatti, labourers are attracted to non-agricultural pursuits, and consequently there is a dearth of labourers for agricultural operations. Consequently there is a demand for higher wages. Agricultural labour is usually paid in kind. 2 Madras Measures of cambu or ragi are given to an adult while 1½ Madras measures are given as wages to a female. Cotton picking is paid by piece work. Usually 1/16 of the cotton picked is paid as the day wages.

The Pink Boll Worm and the Pest Act.

Y. RAMACHANDRA RAO, M. A., ASSISTANT ENTOMOLOGIST.

The Pest Act is a much maligned piece of legislation. No enactment can be more honest or has been made with better intentions. Its sole aim is to reduce the sum total of ills, due to the depredations of insect pests or the spread of injurious weeds.

What is really needed to make the Act popular or better understood is a systematic education of the public mind by distributing posters, leaflets etc. Since the Pest Act deals with measures of a preventive nature, which an intelligent ryot can adopt of his own accord, the necessity of such an act may perhaps be questioned. Where large areas are concerned, it would be rather difficult to expect all individuals affected to follow the measures recommended. There are always some individuals who, out of ignorance, out of indifference or even out of perversity, may not be prepared to act according to advice. In such cases negligence on their part is not only against their own interests, but has even the effect of nullifying the efforts made by the rest of the community in following the advice, and renders all the expense incurred fruitless. To tackle people of this category it is essential to have a weapon whereby they can be compelled by law to follow such advice, and to make them adopt measures conducive to the general good. As an instance may be quoted the case of the Water-Hyacinth which, originally introduced from foreign countries as a curiosity, has, with its power of rapidly increasing in numbers, become a veritable nuisance, over-running ponds and tanks, blocking up water channels and harbouring malarial mosquitoes which breed in security. Unless the whole community attends to its destruction in co-operation with one another, its eradication cannot be accomplished. Hence the application of the Pest Act.

In the Coimbatore, Salem, Trichinopoly and Madura Districts, the Pest Act has become familiar to the people, owing to the efforts to keep down the spread of certain cotton pests which had become increasingly abundant during recent years. One of these is the cotton

Stem-Weevil, which attacks the stems of cotton plants and causes a swelling in the parts affected. This part is weakened and affected parts are liable to break in high winds, while young plants are actually killed outright. Another is the Pink Boll Worm. This insect attacks the bolls of cotton, bores into them, empties the seeds and spoils the lint. Where infestation is bad, there may be as many as 11 worms in one boll, while all the seeds may be eaten hollow and the lint, rendered worthless. Even in moderate degrees of infestation, even though the unattacked part of the cotton collected—supposing it could be separated from the affected kappas—could fetch full value yet in practice it is not possible to keep them separate and they get mixed together; so that the value of the adulterated kappas is brought down perceptibly—not only because the lint of affected bolls is stained brown, but also owing to the circumstance that it becomes "killed" i. e., it becomes deficient in tensile strength.

In India the pink boll worm is no new introduction, but, into other countries as Egypt and America, has been unwittingly carried by means of infested seed or lint. In Egypt the damage assumed such immense proportions that it has led to the maintenance of a huge staff for its investigation and check. The net value of such investigations was the discovery that in that climate the pest was carried over from one season to another in the form of resting long-cycle-larvæ which passed the winter, hidden in the hollowed seeds, and emerged as moths in the spring. This led to the enactment of laws making it compulsory for the ginners to have all seed treated by heat so as kill such resting boll worms. The cotton crop was also compulsorily pulled off the ground by November and all bolls, destroyed; and early maturing varieties of cotton were recommended to be raised. The result was the percentage of infestation went down considerably.

In South India, on the other hand, the conditions are entirely different. The pink boll worm is a native of the soil, and in country cottons, the infestation was not and is not even now of much account. The conditions changed when a superior variety like the Cambodia was introduced. Not only were the Cambodia plants less hardy but as the new cotton could be grown as a

perennial and heavy yield, taken for two years or more, the ryots were tempted to keep them on the ground continuously. Facilities for the increase of all cotton pests were thus provided. The quality of Cambodia was deteriorating rapidly, mostly on account of the boll worm attack and there was bound to be a crash in the prices. An investigation of the life history of this pest around Coimbatore was taken up and worked out on the lines of the Egyptian commission. It was soon obvious that in South India there was no appreciable cold in winter, long-cycle-larvæ were non-existent, and the only way to check the increase of this pest was to secure sufficient break in the growing period of cotton, whereby the pest could be starved out altogether or at least diminished to so low an extent that it could not get a good start in the succeeding season. This, in short, was the genesis of the application of the Pest Act for the control of the pink boll worm in Coimbatore.

In this connection, it would perhaps be advantageous to have a knowledge of the life-history of the pink boll worm. The moth is a dusky coloured insect, which hides in dark corners during day time and actively flies about at night. It lays small pearl-white eggs in corners on the leaves, the bracts, the bases of bolls and on the flowers. The egg hatches in about 4 days into a young caterpillar which wanders actively on the plants in search of bolls and rarely flower buds, into which it begins to bore. The minute hole by means of which it enters the rind of the boll soon heals and all external sign of the attack is lost, until the time when the caterpillar becomes full grown and bites its way out through a round hole. The young caterpillar after entering in, seeks the seed, and, boring its way in, begins to feed on its contents; 4 to 6 seeds may be eaten in succession before it becomes fullgrown. It is generally a clean feeder—usually restricting itself to the seeds alone and attacking the lint only in young bolls; whereas the other boll worm—the spotted one—makes a mess of the whole fruit attacking the lint, seed and rind.

When, fullgrown it leaves the boll and may descend to the ground, and prepare its cocoon in the soil or among fallen leaves

or it may construct its cocoon in the kapas of open bolls; or sometimes at the base of the bolls between the bracts. Inside the cocoon it turns into a seed-like object—the pupa, which emerges after about a week as the dusk brown moth mentioned above. Each female moth lays after mating as many as 200—400 eggs so that the progeny of a single moth in one generation, occupying the space of about a month, will be about 400 pink boll worms, while in the second generation, supposing that only half the number are females, the progeny will number 200×400 or 80,000, while in the third, it will be 16 millions. It will thus be seen that supposing there were only one male and one female moth at the time cotton was sown, there is a likelihood of there being at the end of the cotton growing period, millions of boll worms resulting from such a single original pair. If at this rate a continuity of plantfood is provided, the resulting enormousness of the numbers can better be imagined than described. The chief point on which the Pest Act relies for bringing about the check of this pest is the elimination of this factor of the continuity of food material throughout the year; and what is more important, the destruction of the bolls after pulling out the crop. By this means, a check is provided against the unlimited multiplication of the insect; and allowance being made for a clear off-period for cotton, it may be expected that the greater number of the boll worms would be starved out and that the succeeding crop may consequently be expected to start with as few a number of the moths as possible.

Requisites for the proper working of the Pest Act. From the above it may easily be judged that, if the Pest Act is to show convincing results, the all-important point to be attended to is thoroughness of the application. If, in a village out of a hundred fields cotton in one field is left unremoved, enough moths will be produced from that one bit to nullify the results of all the trouble taken in the rest of the area. Unfortunately there is a desire in some quarters to evade the law and from yet other quarters applications pour in for exemption, in some cases on the ground of poverty and in others due to little else than selfish gain. It is very important that people should recognise that such

exemptions—if granted—go against the spirit of the Act. One of the requirements of the Act with regard to the cotton pests is that the cotton should be off the ground by the 1st August. It is needless to say that it only marks the time limit, for the *completion of the operation and not of the beginning and that the aim is the creation of a definite interval, when the whole tract affected would be without cotton on the ground.*

Results of application and statistics. Though it is regrettable that the Pest Act has not yet been applied with the requisite degree of thoroughness throughout the required area, yet the statistics collected at the office of the Government Entomologist during the past two years serve to give a decidedly favourable view as to the efficacy of the Act. Arrangements have been made for the collection and forwardal to the Government Entomologist every week about 100 green bolls from certain localities within the Pest Act area and from certain others without. These bolls are thoroughly examined on receipt. A comparison of the figures, a mass of which have thus been accumulated clearly makes it evident that where the Act has been thoroughly applied there has been a perceptible reduction in the infestation.

(1) Central Farm — Green boll infestation at Central Farm

July 1919	July 1920
75%—84%	42%—51%

(2) Green boll infestation in last week of March 1921. Pest Act area averaged 10·9%. Non-Pest Act area averaged 33·85%

(3) Examination of ginned seed — April—May 1921

Tiruppur	Virudupatti (Non-Pest Act area)
5% damage.	15%

(4) There is concensus of opinion among cotton merchants at Tiruppur that the quality of the kapas is decidedly better than in previous years—evidently the effect of the Pest Act.

(5) Mr. Osbourne of Harvey & Co., Virudupatti, also declared that Tiruppur lint is decidedly better now than previously.

Agriculture Science as a Career.

"BY MISUNDERSTOOD."

An article under the above heading in the Journal of the Ministry of Agriculture September 1921 forms interesting as well as instructive reading. It is not a general dissertation on the subject, as one may naturally mistake from the title, but deals with the present prospects of Agricultural Science as a career in England. As compared with the United States where the development of Agricultural Science has received special attention since a long time, England has been rather late in starting: in fact it was war that gave a definite impetus towards the expansion of research in Agricultural Science.

Whereas in the United States, as in India, Agricultural Research and propaganda are thoroughly state-controlled, in England at the present time, they are conducted by private bodies assisted by grants-in-aid from the Ministry of Agriculture. Research work in Agricultural Science is conducted in Research Institutes—generally attached to a University or a University College and usually specialising in particular branches of science—such as Plant-breeding, Soil Physics and Animal Industry—while propaganda and demonstration work forms the duty of an "Advisory" staff of specialists in various branches such as Botany, Chemistry, Entomology and Veterinary Science. These latter are attached to every one of the "Provinces" into which England and Wales have been divided for purposes of Agricultural Education, and their services are always at the disposal of the farmers of the particular Provinces.

Each of the Research Institutes is independent and self-governing, but certain grades of staff appear to have been established common to all.

(1) There is a Director of the Institute with a personal salary (perhaps about £ 1000 to £ 1200 per annum).
(1225 Rs.—1500 Rs. per mensem.)

(2) *Principal Assistants*—£ 600 to £ 800 rising by annual increments. (Rs. 750—Rs. 1000 per mensem.)

(3) Senior Assistants—£ 400 to £ 600 with annual increments. (Rs. 500-- Rs. 750 per mensem.)

(4) *Assistants*—£ 300—£ 360. (Rs. 375 to Rs. 450 p. m.)

(5) Temporary Junior Assistants with varying salaries.

In addition a bonus, the amount of which is subject to revision from time to time as the cost of living falls, is stated to be given at present to Assistants, Senior Assistants and Principal Assistants. At the present time the bonus is reported to be £ 150 on salaries of £ 400 and under and 15% on amounts over that sum. The Senior and Principal Assistants are permanent and are equal in rank to a Professor or Reader of a University, while the Assistants are considered to be more or less temporary.

The recruitment to the Scientific staff mentioned above is from graduates with honours in Natual Science who have since specialised in some branch of science with an agricultural bearing—frequently with the aid of a Research Scholarship from the Ministry. There appear to be 5 Research Scholarships granted annually—carrying about £ 200 a year and in addition a few travelling scholarships are also granted, enabling post-graduates to get further specialisation in their subjects for foreign Universities. It is rather important to note that the Research Institutes are independent and self-governing, but are at the same time recipients of contributions from the Ministry in the shape of grants-in-aid voted every year by the Parliament. In the opinion of the writer this method of control by grants-in-aid without direct administrative responsibility ensures a minimum of state interference combined with the most favourable conditions for carrying out research; for according to him, "while theoretically it is possible to conduct research in a Government Department, it hardly admits of doubt that the atmosphere of the University is more conducive to good work." In support of this argument he quotes the speech of Sir D. Hall (Trueman Wood Lecture, Royal Society of Arts 1921). "When one considers the nature of Research, the slowness and irregularity with which results of economic value accrue, the remoteness of its methods from those

of a public Department, and particularly the character and personality of the men who distinguish themselves in research, it will be generally agreed that the looser system of control prevailing in a University is the most appropriate. The true investigator is somewhat anarchical in temperament, his work is apt to be continuously destructive of accepted opinions and established reputations..... .....The type of man wanted for Research is more attracted to a University than to a Department..... A second advantage which comes from the association of Research Institutes with the University lies in the informal co-operation that is thereby ensured with the workers in the field of pure science.....

Lastly contact with the business of farming is more readily attained by the association of Research Institutes with a University which is teaching agriculture and dealing with the farmers of its district than with a Government Department."

There is little doubt that Indian conditions are entirely different from those obtaining in England. It is but natural that, in England, where there exist Universities of long standing and with accumulated traditions of centuries and a scientific atmosphere created by a billiant galaxy of workers, Agricultural Research Institutes should be attached to them, but in India, where Agricultural Research had to be started by the State, the Institutes are naturally of a Departmental character. Nevertheless there is no gainsaying the fact that, if the real Research work is to be done, it should be shackled as little as possible by the worries and ways of officialdom. The proposal to affiliate our college to the Madras University is from this point of view a step very much to be welcomed.

Again a comparison of the salaries that the staff of the Research Institutes get, with those obtaining in India, is of some interest to us here. Even allowing for the high cost of living in England as compared with India, the poor start given to the Agricultural graduates here in proportion to the salaries of the men in the top rungs, and again the disproportionate difference of

salaries between men in the intermediate stages, are striking. Barring a few, the majority of the people that take up Agricultural science as a profession find it an ill-paid one; for they start low and the intermediate stages are so slow that in middle age they find themselves handicapped by insufficient salaries.

In words instinct with nobility and patriotism the writer concludes his article on "Agricultural Science as a Career" as follows:—"To the country the scheme (now working in England) promises a succession of able investigators making Agricultural Research their lifework, to the worker it promises a career free, as far as is reasonably possible, from the disheartening cares of an ill-paid profession; to the young graduate it promises a ladder, not to riches, but to the highest rewards of Science—the discovery of truth, the advancement of public good, and the esteem and appreciation, never unduly bestowed, of his fellow-countrymen." May the same prove true in India.

Students' Corner.

Inter class Tournament for the "Victory cup."

Matches in connection with the above tournament tho' commenced in the early half of November did not come to a close before a month elapsed for the reason that the victors had to come out successful in two out of the three games viz., cricket, football and hockey. The third year class which possessed an all round team won the much coveted trophy after a hard fight especially in hockey. The details of the games are appended below.

Cricket.

Class I. / Class B	B won by 110 to 52	B won by 64 to 55	III won by 114
Class II.			
Class III. / Class A	III Won by 9 wkts.	III	
Class IV	Scratched.		

Hockey.

Class I Class B	I won by 1 goal to Nil.	II defeat I by 1 goal to nil.	III won by 3 goals to nil.
Class II			
Class III Class A	III won by 2 goal to nil.	III	
Class IV	Scratched.		

Football.

Class I Class B	B won by 2 goals to nil.	B won by 1 goal to nil.	Finals was not played as the 3rd year had run out successful in the other two games.
Class III			
Class III Class A	Won by 6 goals to nil.		
Class IV	Seratched.		

WANTED.

A cotton Cultivation Expert, knowing Tamil language for Gandamanayakanur Zemindary, Periyakulam Taluk, Madura (S. I). Applicant should be connected with cotton cultivation and its improvement, one who has successfully cultivated. He should be energetic and of active habits and able to ride about. Free quarters and better pay and prospects than in Government service to the selected candidate on a three years' agreement. Apply giving fullest particulars, age qualifications, previous experience, references terms and conditions to Pestonji D. Patel, Ismail Buildings Hornby Road, Bombay.

WANTED.

Applications from educated and qualified men for the post of Assistant Farm Overseer in this depot on Rs. 50-3-75.

2. Applicants should have knowledge of cultivation of fodder crops such as Oats, Lucerne, Jowari, Cowpea and various kinds of grass and with a certain amount of knowledge of Arboriculture and Vegetable gardening, also the management of bullocks.

Applications should contain the following particulars.

1. Name 2. Age 3. University certificate held 4. Certificate obtained from an Agricultural College. 5. Previous experience on an Agricultural Farm, if any.

J. C. HOTHAM, Major,
Supdt. Hosur Remount Depot.

G. O. No. N. Mis. 1390 dated 28-7-21.

The Government have carefully considered the memorials of the Lower Subordinates of the Agricultural Department and regret they are unable to accede to the requests contained in paragraphs 1, 2 and 4 of the memorial.

The Government will in future be prepared to allow the promotion of competent Lower Subordinates to the Upper Division in special cases on the recommendation of the Director of Agriculture.

(By order of the Government, Ministry of Development).

(Sd.) K Nageswara Raw,
For Secretary to Government.

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Rajah Vasudeva Rajah of Kollengode, C. I. E.

The Hon'ble Lieutenant Moopil Nayar of Kavalapara.

Lieutenant The Rajah Sahib of Parlakimidi.

Veerarayan Thirumulpad of Nilambur.

Vengail K. Krishnan Nayanar.

Lieutenant The Rajah of Ramnad, M. L. C.

The Hon'ble Dewan Bahadur V. Ramabhadra Nayudu, Zamindar of Doddappanaickanur.

V. Madhava Rajah of Kollengode.

The Raja of Dharakota.

T. A. Ramalingam Chettiar, M. L. C.

The Hon'ble Dewan Bahadur A. P. Patro, M. L. C., Minister, for Education.

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Dewan Bahadur Sir P. Theagaraja Chettiar, M. L. C.

Malayandi Chettiar.

V. C. Vellingiri Gounder, M. L. C.

V. Arumugam Pillai of Sundakamuthur.

Khan Bahadur Haji Abdullah Haji Kasim Sahib Bahadur, Udipi.

BENEFACTORS.

Kochu Kunjunni Achan, P.

ASSOCIATES.

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Editorial Notes.

COLLEGE DAY AND CONFERENCE.

The recent celebration of the College Day in December 1921 helps us to realise—with perhaps a tribute to the inexorable might of Father Time—that a dozen eventful years have already passed, since our Agricultural College and Research Institute was formally opened by His Excellency, Sir Arthur Lawley, in July 1909. During all these years, the Union has had every reason to congratulate itself on exhibiting a record of steady and uniform progress and on showing an expansion both in strength and in the sphere of its usefulness. The College Day festivities—including the Annual Athletic Sports and the Agricultural Conference in its programme—celebrated under the auspices of the Union, have become the great event of the year in our Institute, and its advent, not only provides a welcome relief to the District and the College Staff from the humdrum daily round of routine work, and affords facilities for members to meet old friends and colleagues, but also forms a most fitting opportunity for workers in different lines to compare notes with one another and to draw an inspiration for further work from the experience of other workers, as detailed in papers read at the Conference.

Following the change in date inaugurated in 1919, the Twelfth College Day and Conference were held in the

July, as was the practice in the earlier years. Though this change is advantageous in many respects, it is to be feared that it handicaps the "artistes" among the students in the progress of their studies owing to the clash between their preparation for December Examinations and the rehearsals for the dramatic entertainments.

The weather—which is usually liable to sudden outbursts of the North-East monsoon in the month of December—was fortunately very propitious throughout the period of the celebrations; and with fine bright days and cool nights, none of the functions were marred by the vagaries of the weather.

The Guests. Some of the visitors arrived on the 18th December but the major number reached Coimbatore on the 19th. The band of student-volunteers, working under the Captainship of Mr. K. Ramiah received the visitors at the station and further attended to their comforts. Our thanks are due to the Warden—Mr. T. V. Ramakrishna Aiyar for making the new block of students' quarters available for lodging the visitors; and their boarding was catered to by the Officers' Mess newly opened in the premises of the Officers' Club under the supervision of a special committee. The following were some of the non-departmental visitors:—(a full list of departmental visitors is appended elsewhere).

Mr. N. MacMichael, M. A., I. C. S.
Mr. and Mrs. H. L. Braidwood.
Mr. K. Brahma Sastri, Honorary Visitor.
Rao Bahadur J. Chelva Ranga Raju.
Mr. C. V. Venkataramana Ayyangar, M. L. C.
Mr. V. C. Vellingiri Gounder, M. L. C.
Rao Sahib Ratnasabhapathy Mudaliar, B. A., B. L

We express our feeling of indebtedness to the Director of Agriculture—Mr. H. C. Sampson, B. Sc., C. I. E., for having permitted many of the subordinate staff to attend the conference and read papers. One, however, missed the presence of some of the familiar figures of the previous conferences: as for instance, Mr. Vengail K. Krishna Nayanar who telegraphed his inability to attend owing to ill-health. We are glad to announce, however, his splendid offer of Rs. 1,000/- towards establishing a prize for the first successful student in Practical Agriculture, for which the Union is extremely thankful.

Athletic Sports. On the morning of the 19th December the whole of the play-ground looked as if it had been transformed by magic. With three large tents to accommodate, respectively, the European and the Indian guests and the Indian ladies, with the sports-arena neatly fenced round and fitted with all its paraphernalia of hurdles scaffolds, casks and similar appurtenances, and with the whole area decorated with flags and buntings of all sizes, the ground presented an altogether gala appearance. The guests began to arrive at about 2 P. M., and by 3 P. M when the sports commenced, a large crowd of sightseers from the villages and the town had already gathered.

The grateful thanks of the Union are due to Mrs. Anstead, who gladly undertook and was entirely responsible for the arrangement of the refreshments for guests of European habits of living, while the Indian guests were attended to by the band of volunteers, and refreshments were served to them inside the Students' Pavilion. The success of this section is due to the energies of the Reception Committee to whom our thanks are due.

The various events. The cross country race of five miles—the most arduous of all the events—had been run

finished on the 17th December. There were 32 entries, of which 24 competed for all the events; keen competition was noticeable in many of the items as a result of which previous records were broken in no less than four of them. The Sports Secretary very much regrets that none of the elderly Old Boys showed spirit enough to partake in the Old Boys' Race of 100 yards. The Obstacle Race—which symbolises the experiences of most people in the race of Life—proved the source of much amusement to the spectators. Other interesting events were the Inter-tutorial Tug-of-war, races for children over seven years of age, and for those under, the peons' race and the greasy pole. The inter-tutorial Relay Race was adjudged two days later, as it was not run satisfactorily on the 19th December.

The special feature of this year's sports was the arrangement devised by the Sports Secretary, Mr. U. Vittal Rao, whereby the results of each particular event were immediatety made known to the spectators by a system of signboards and numbers—indicating respectively the event and the serial number of the winning competitors. Another very interesting feature was the help received from the little troop of Estate Boy-scouts and cubs, under the lead of their Scout-Masters, Messrs: D. Marudarajan and C. S. Gopalaswami Rao. These citizens in embryo deserve all praise for the efficient way in which they performed the little tasks entrusted to them for keeping order among the spectators.

At the close of the evening, all the spectators gathered round to witness the distribution of prizes to the successful competitors. In requesting Mrs. Parnell to present the prizes, Mr. Parnell said that the present year's sports were specially noteworthy, as the winners in some of the

events had beaten all previous records. Vengail Krishna Nayanar Cup for the champion of the year, Mrs. Anstead cup for one mile race and Dr. Norris cup for cross country race were won by C. S. Doraiswamy, while the Saidapet "Old Boys" cup for 100 yards race was won by H. Balraj, Ramnad Shield for inter-tutorial tug-of-war was won by Rao Sahib Ramasami Sivan's wards and the Victory cup for the inter-class sports, by Class III. Father Rondy's shield for cricket won by the College team this year was also presented on this occasion.

After the prizes had been kindly given away by Mrs. Parnell—many of the prize-winners being greeted with loud applause at the time of presentation—Mr. Parnell announced the glad news of the promised offer, by Mr. V. Arumugam Pillai of Sundakamuthur, one of our Patrons, of a cup—to be styled the "Prince of Wales Cup" —for one of the College Day events to be decided by a Committee later on. We voice the feeling of thankfulness of the Union to the donor for this generous gift.

The eventful day was brought to a close by a hearty response to a call for cheers to Mrs. Parnell and the guests of the evening.

The heartfelt thanks of the Union are due to the following gentlemen who helped to make the sports a success:—Messrs. R. D. Antead, R. N. Savur, A. C. Edmonds and Rao Sahib M. R. Ramasami Sivan for acting as Judges, Messrs. F. R. Parnell and F. T. T. Newland as Time-keepers and Dr. R. V. Norris and Messrs. D. G. Munro and N. S. Kulandasami Pillai as starters. The thanks of the Union are due to the Sports Committee who spared no pains to make the evening's sports the unqualified success it was.

At 8 A. M. on the 20th December, all the Farm

The Agricultural Conference. The conference met in the large hall on the ground floor of the College at 12 noon on Tuesday the 20th December, when the President-elect—N. MacMichael Esq., M. A., I. C. S., Commissioner of Land Revenue and Settlement, declared the conference open.

The President of the Union—our Principal, Mr. R. C. Wood—then delivered his address of welcome to the visitors (printed elsewhere in extenso), assuring them that his welcome was not merely an official formality, but was in most cases on a personal footing. He then traced the history of the past conferences and delivered a note of warning to the students regarding some of the probable consequences of the coming change in the college courses, but declared that he was confident that all the impending changes could be faced without anxiety, since he believed in the soundness of the present courses.

The General Secretary—Mr. K. T. Bhandary—then read his Annual Report, giving an account of the progress made during the year by the Union in various directions.

The President-elect, then, delivered his Presidential address which is printed elsewhere in extenso.

Diplomas were then presented by the President to the successful candidates of the Old Diploma Course. It is very pleasing to note that all the seventeen students of the class secured the Diploma this year. (For complete list, see Appendix V). We congratulate V. T. Subbayya Mudaliar on securing the Robertson Medal for General Proficiency, P. Krishna Rao, the Keess Medal in Chemistry, and E. K. Govindan Nambiar and Vasudeva Rao Nayudu (declared equal) on getting the D'Sylva Medal.

The President then called on Mrs. Dorothy Norris, M. Sc., Government Agricultural Bacteriologist, to read her

paper on "Agricultural Bacteriology" (published elsewhere) wherein she set forth the importance of Bacteriology in Practical Agriculture.

In the absence of the writer of the paper and in view of the fact that it was received very late, Mr. E. V. Sundara Reddi's paper on" "Agricultural Production" was taken as read. It is published in extenso in this issue.

Mr Venkata Rao Badami—Senior Assistant Botanist in the Mysore State, and one of the brilliant Alumni of this College—was then called on to read his paper on " Harvest Exhibitions".

Supplementing his paper by the exhibition of numerous mounted sheets of Ragi earheads of various types cultivated in the State of Mysore, he explained how exhibitions—especially Rural Shows—may be exploited for actively encouraging the ryots to gather only the best earheads for purposes of seed and to use only such selected seed for sowing. He gave an interesting account of his own experiences in the matter and of the important results achieved in Mysore by continued selection on pure lines. A very interesting discussion followed.

At 3 P. M. the Conference adjourned till 8 A. M. the following morning.

At 5 P. M., there was an interesting Hockey match played by the Present Students against the " Old Boys", in which the present students won, scoring five goals to one.

At 7 P. M. the customary Bonfire was lit in orthodox fashion on a part of the Maidan, to commemorate the presentation of the diplomas. Though the pile of cotton stalks was not as large as usual and the bonfire did not last long enough, as on some similar occasions in the past to induce the formation of tug-of-war teams, yet a fair number of spectators gathered round to enjoy the warmth and glow

At 9 P. M., the visitors—European and Indian—and the denizens of the estate gathered in numbers in the theatre improvised for the evening in the Conference Hall, to witness the performance of a Telugu Drama—Harischandra—by the students. The performance was very interesting, and the dance of Bhagiratha Phadi as a dancing-girl drew great applause. The versatile genius of Sudarsanam, who impersonated no less than three characters and acted superbly in every one of them, and the comic acting displayed by V. Suryanarayana as Nakshatraka, are specially worth mention.

The usual Group Photograph was taken at 8 A. M on the 21st December inside the College quadrangle, after which the gathering adjourned to the Conference Hall.

At 8-15 A. M. the President called on Mr. Y. Ramachandra Rao to read his paper on "Juniors and Research work," wherein the writer exhorted the Juniors to begin work in earnest and set about to build up an atmosphere of true scientific spirit in our Institute.

This was followed by a paper by Mr. K. T. Alwa on "Why the Department has not impressed the public so far?," which was read by Mr. K. Raghavachari in the absence of the writer. He was of the opinion that the failure was due to the Department not having gone to the ryot direct in the earlier years; it had instead sought the mediation of the rich lawyer who was at best only an absentee landlord. He declared that the demonstrator should shake off all urban influences and seek to reach the ryot at his own door. A very interesting discussion followed, in which Messrs. C. V. Venkataramana Ayyangar M. L. C., Vellingiri Goundar M. L. C. and Rao Sahib M. R. Ramaswami Sivan took part.

Mr. M. Ananthan L. Ag., then read his paper on the "Possibilities of Plant-Breeding," illustrating his paper with diagrams as to how the Laws of Heredity work and demonstrated with specimens of Paddy plants the inheritance of characters by the progeny of crosses. There was an interesting discussion in which Messrs. C. Tadulingam and S. Sundararaman took part.

The Conference adjourned for lunch at 11 A. M. and met again at 1 P. M

Mr. Govindan Nambiyar L. Ag., read his paper on 'Coconut cultivation in the Laccadives'" wherein he gave an interesting account of the nature and habits of the inhabitants, laying special stress on the importance of coconut cultivation in their internal economics.

An interesting discussion ensued in which Messrs. Sampson, Sivan, Norris and J. Chelva Ranga Raju took part.

Mr. B. Viswanath was next called upon to read his paper on "The Management of Alkaline soils", in which he dealt with the movements of salts in soils and the practical aspect of irrigation and conservation of moisture in the management of salt-affected lands. Mr. R. C. Wood and Rao Sahib Sivan took part in the discussion.

Mr. Jogi Raju D. A. then followed with his paper on "Paddy Varietal Experiments," wherein he laid stress on the many difficulties encountered in conducting experiments in Paddy. Mr. Parnell then spoke making certain observations in support of Mr. Jogiraju's experiences.

Mr. Sitarama Patrudu L. Ag., then read his paper on "Gogu cultivation in the Vizagapatam District" in which he showed that it was a profitable crop in the northern part of the District and declared that it found much favour among

the ryots of that tract. In the discussion that ensued Messrs. D. Balakrishnamurthi, J. Chelva Ranga Raju, and Vellingiri Gounder took part.

Mr. Huidekoper's paper on "Agriculture as a profession" having been taken as read for want of time, the President made his concluding remarks, wherein he requested the members of the Legislative Councils to get themselves acquainted with the work of the Agricultural Department before they launched on criticisms. After announcing Mr. Vengail Krishnan Nayanar's donation of Rs. 1000/- towards a prize, the President declared the Conference closed.

At 7 A. M. Mr. K. Venkata Rao Badami exhibited numerous lantern slides, illustrating the work done in Mysore towards improving the strains of Ragi by continued selection. The exhibition was interesting as well as instructive.

At 9 P. M. the Tamil students staged "Kamalesan" which was greatly appreciated by the crowded audience. Though it is invidious to make distinctions between the various actors, when all of them did well, special mention must be made of the splendid performances of Balakrishnan —the hero,—Ramayya Mudaliar—the heroine and Swaminadhan—the Queen, who repeatedly received the approbation of the audience and lastly of the clown—P. Rajaratnam, who, by his ready wit, kept the house in roars of laughter.

Towards the close of the performance, Mr. Venkata Rao Badami announced his intention of presenting the Union with a fine drop-curtain—containing the figure of our College—before the next annual meeting. Our sincere thanks are due to him for this splendid offer.

We have since received the promise of the presentation of a curtain each from Rao Bahadur J. Chelvaranga Raju Garu on behalf of his brother, and from Mr. K. Ramiah, for

We take this opportunity of thanking the entertainment committee-especially Mr. Rajagopalayyar—and several other gentlemen for their invaluable help, unstintingly given, in making the dramatic entertainments a success, and to Mr. Newland and all his staff—especially Mr. Venkateswara Ayyar—for fitting up the stage and installing the electric lights.

Last—but not least—our grateful thanks are due to our President, Mr. R. C. Wood, for help given in various matters, and to all the Heads of Sections for assistance readily rendered.

The business Meeting. At 8 A. M. on the 22nd December, the annual business meeting of the General Body of the Union was held with the President—Mr. R. C. Wood—in the chair, when the following subjects were discussed. (1) The building fund, (2) The Journal and its Finance, and (3) The difference in the initial pay in the Scientific and Agricultural sections.

Regarding items (i) and (ii), it was decided after much discussion that attempts should be made to raise a building for the permanent habitation of the Union and to try to run the Journal more regularly in the future.

As to item (3), the following rssolution was carried unanimously.—'that Licentiates and Diplomates in the Agricultural Section be given an initial pay as that in the Science Sections, if not more, and the Director of Agriculture be requested to take early steps to give effect to this.''

The election of fresh office-bearers for the coming year was next proceeded with, with the Vice-President in the chair. We are glad to state that Mr. C. Tadulinga Mudaliar—our popular Vice-President has again been re-elected.

In the course of the meeting, Mr. K. Adinarayana Rao announced his donation of a sum of Rs. 100/- to the Building Fund which was accepted with thanks. We appeal to the generosity of our members to follow his excellent example, so as to make the proposal to house the Union a tangible reality.

A vote of thanks was next proposed to the members of the retiring committee, individually as well as collectively, in appreciation of the work turned out by them in spite of adverse circumstances ; and was adopted unanimously amidst cheers.

At 2 P. M., the subscribers to the Ramasastrulu Nayudus Memorial Fund met together and discussed ways and means of prepetuating the memory of the late Mr. Ramasastrulu Nayudu. The resolution arrived at, at the meeting, will apear in the January issue with full particulars.

At 5. P. M. on the 22nd, the working committee of the Union was at home to all the visitors and to the members of the various sub-committees who contributed to the success of the present College Day and avails itself of this opportunity to render them its heartfelt thanks for their ungrudging services.

The majority of the guests departed from Coimbatore by the evening mail of 23rd instant, leaving the little colony on the estate—itself numerically thinned by the exodus due to the Christmas holidays—to feel its loneliness all the more by contrast, after the crowded programmes and the altogether busy time it had, during the College Day Festivities.

REPORT
OF THE
WORKING COMMITTEE
for the year 1920—21.

The Working Committee begs to submit its annual report for the year ending 30th November 1921.

The year under report has been very momentous in the annals of the British administration in India in that, on the eve of the opening of a new chapter which ushered in parliamentary institutions in this country, a member of the Royal House, His Royal Highness the Duke of Connaught paid a visit in January last as the representative of the King Emperor and inaugurated the opening of the several Legislative assemblies.

We are glad to mention that the Heir-apparent, His Royal Highness, The Prince of Wales is now in our midst to acquaint himself with his Indian subjects and we extend our respectful welcome to him.

This year witnessed a notable change in the control and administration of the Department. It has now come under the portfolio of the Minister for Development. We welcome the appointment of the Hon'ble Rao Bahadur K. Venkata Reddi Nayudu Garu, B. A., B. L., M. L. C., as our Minister and hope that this department will, under his care and able guidance which has been amply testified during the past few months, expand in all directions consistently with the advancement of the country.

OUR MINISTER.

A signal instance of the change was witnessed in the due recognition given to the claims of Indians for positions of trust and responsibility in the Imperial cadre. We are sure this was, to a great extent, hastened by the large-hearted and liberal attitude of the late Mr. G. A. D. Stuart whose loss we mourn to-day.

This Union at its meeting held on 22-12-1920 passed a resolution that it was desirable to affiliate the Agricultural College to the University and forwarded it to the Director. It is gratifying to us to know that the Government was pleased to view this question favourably and the subject is now before the Senate. We are sanguine that Mr. Sampson, our present Director, will with his usual perseverance, endeavour to get the College affiliated and raised to a status on a par with that of the Agricultural Colleges in other parts of the Empire, securing the benefit of such affiliation to the students who were admitted in 1920. We congratulate ourselves on the splendid response students made to the call of the then Director the Hon'ble Dewan Bahadur L. D. Swamikannu Pillai Avergal, M. A., L. L. B., I. S. O., who was very enthusiastic in this cause.

UNIVERSITY AFFILIATION.

The Madras Government have been very generous in allotting funds for this Department. In regard to their solicitude for the advancement of Agriculture no better evidence is needed than the construction of a separate building to house the Teaching Section and thus meet the ever-growing demands for accommodation. They have been further liberal in increasing the percentage of Indians in the superior grades for

EXPANSION.

which this Union and the members of the Department feel very grateful.

PAY AND PROSPECTS.

The proposals in connection with the salaries of the subordinate staff have equally engaged the attention of the Government whose orders on what is known as the Knapp's Scheme have been just received and are being given effect to. The general feeling is that the orders do not afford adequte relief though they are a step in advance towards that end. The smaller percentage of appointments in the higher grades would still leave unsolved the question of the pay and prospects of men in the bottom grades.

The discriminatory treatment given to the Licentiates in Agriculture in the matter of pay and grade in the Executive and Science Sections is, in the humble opinion of the Committee, very discouraging and tends to perpetuate a difference which is not based on facts. The Committee would in this connection urge the vigorous plea put forth on behalf of the Executive officers by the Indian Sugar Committee, as the result of their intimate knowledge of conditions in the various Provinces visited by them—the plea "we are profoundly convinced that that object (the great acceleration in the process of spreading agricultural improvements) will not be realised so long as demonstration is not given the recognition and the esteem it deserves. Demonstration is not the hand maid of research but its full and equal partner. Research without demonstration is as useless to Indian Agriculture as demonstration without research. Demonstration requires its full share of the best men in the Department." There is thus no valid ground for any invidious distinc-

tion. The Council of this Union has taken action already in this matter and is hopeful that, during the regime of the present Director who has firsthand knowledge of District conditions, the matter will be set right.

During the year under report it was our melancholy duty to record the death of Mr. G. A. D. Stuart, the Director, than whom a more capable, concientious and hardworking officer it is rare to find. We do hope that some generous gentleman will come forward to keep his memory green in this College and in the Department with which he was connected for over 8 years and which he marvellously developed.

OUR DIRECTORS.

The choice of Mr. Sampson as his successor is in keeping with the policy now obtaining in the other Provinces and we are sure that his tenure of office will prove an all-round success.

There have been changes in the Presidentship of the Union consequent upon changes in Principalship of the College. We express our heartfelt thanks to Dr. R. V. Norris and Messrs. G. R. Hilson and F. R. Parnell who took warm interest in the affairs of the Union.

Our Presidents.

The last conference was held during the three days —20th to 22nd—of December 1920. It was our proud privilege to invite Dewan Bahadur Sir P. Theagaraya Chettiar, B. A., M. L. C., the distinguished President of the Madras Corporation and one of the foremost leaders of public opinion in this Presidency, to preside over our deliberations. With a geniality and with a profound knowledge

PAST CONFERENCE AND SPORTS

of trade and commercial problems extending over 30 years' he gave wholesome advice to the successful students and the young members of the staff and impressed upon them the necessity, in these days, of looking to the uplift of people in the rural parts, unmindful of the glamours of town life. Owing to the urgency of work at Madras, Sir Chettiar could not sit through the whole sessions and on the Second Day, Mr. G. A. D. Stuart took the chair. During these two days in accordance with the wishes of the Hon'ble Mr. M. E. Couchman B. A., I. C. S., the previous year's President, a larger number of the members of the Union contributed papers.

Mr. G. R. Hilson on "Cambodia Cotton."

Mr. K. T. Achayya on "World's Silk Industry—A comparative study."

Mr. S. Sitarama Patrudu on "Cultivation of Sugarcane and its influences on the economic condition of the Hospet Wet land ryot."

Mr. K. Krishnamurthi Rao on "The Sugarcane Industry."

Mr. S. Sundararaman on "Our invisible plant enemies."

Mr. Swami Rao on "How to make farms more popular."

Rao Saheb Seturama Ayyar on "What has been done to fertilise the exhausted soil of the Tanjore Delta."

Mr. S. Subramania Ayyar on "Propaganda work in Agriculture."

The Annual sports were held on the 20th December and Mrs. Hilson kindly gave away the prizes. They were a splendid success, the visitors, the students and the staff evincing greater interest than ever before. The Champion of the year and winner of the Vengayil Nayanar's Cup was again B. Dasappa Malli who scored 59 marks. He also won Dr. Norris' Cup for the Cross Country race as well as the Cup for the Hundred Yards Race instituted by the old Saidapet Boys. Mrs. Anstead's Cup for One Mile Race was secured by K. S. Krishnamurthi again for a second time this year. B. Dasappa Malli was the all-round sportsman of the year and won the Parlakimedi Cup. We wish these both similar success in life and hope other students will emulate their example. We congratulate Messrs. C. Tadulingam and D. Ananda Rao on their wards securing the Chunampet and Ramnad shields for the Relay Race and the Tug-of-War respectively in the Inter-tutorial Competition.

The Committee begs to thank Sir Theagaraya Chettiar, Mr. G. A. D. Stuart, Mrs. Hilson and other ladies and gentlemen who contributed to the success of the Conference by their presence, by the reading of papers, by their suggestions and help or by contributions. The Committee tenders its thanks to Mr. H. Shiva Rao, the Captain, and the volunteers, to Mr. T. V. Ramakrishna Iyer, the Hostel Warden, and Mr. P. A. Raghunathaswami Iyengar, the Assistant Warden, for their ungrudging help.

OBITUARY.

Besides the irreparable loss caused by the sad death of Mr. Stuart in harness, the Committee deplores the demise through blood—poisoning of Subbaratnam, student of Class I in the middle of March. This is the first instance of the death of a student at the College. We equally mourn the death of Mr. J. Lakshmayya, Assistant Farm Manager, Nandyal, during the year.

MEMORIALS.

The collections for the D'Silva Memorial Fund amounted to Rs. 300 and with the Government grant of Rs. 150 totalled up to Rs. 450 which has been, at the instance of the Accountant General, Madras, invested in the Government Securities and the prize is awarded from this year. We thank the Director for taking pains on behalf of this Committee to secure the Government grant. We are glad that Mr. K. Krishnamurthi Rao,—the provisional Secretary—has been able to secure Rs. 475 towards the Ramasastrulu Naidu Memorial Fund. The question of settling the form of this Memorial will be discussed during the current session. The late Mr. Subbaratnam's student friends and admirers have resolved to perpetuate his memory and subscriptions to the extent of a little over Rs. 200 have been promised.

PERSONAL.

Mr. R. C. Wood, M. A., is again our President. His long acquaintance with the affairs of the Union, his genial sympathy, his vigilant eye and active help will, we feel, surely promote its interests. We thank Mr. D. Ananda Rao who was for several years our Vice-President and who worked with zeal and enthusiasm but could not continue in office this year [illegible] more onerous duties. Our genial Secretary

Mr. C. Tadulingam was unanimously elected Vice-President which office he worthily fills.

We congratulate Rao Sahibs M. R. Ramaswami Sivan and T. S. Venkatraman and Messrs. D. Ananda Rao, D. Balakrishnamurthi, S. Sundararaman and G. N. Rangaswami Aiyangar on their promotion to the Imperial Agricultural Service, and Rao Sahib Y. Ramachandra Row and Messrs. B. V. Nath, K. Gopalakrishna Raju, and K. Krishnamurthi Rao, on their attaining Gazetted rank.

OUR YOUNG FRIENDS ABROAD,

Our young friends Messrs. P. V. Isaac, C. Baktha Samuel, C. R. Ranga Reddi and K. Krishna Row Naidu, are still in the United Kingdom. We hope they will soon be appointed to responsible posts under the Crown. It is the unique experience of another member of the Union, Mr. B. Chinnathambi Pillai, to go to Sierra Leone, to act as Technical Adviser in Rice culture. We hope his experience in the Tamil country stands him in good stead there and that he will come back to us with the approbation of his superiors. We send forth our prayers to the Almighty for His blessings on these young friends abroad.

OLD STUDENTS.

We are glad to learn that old students of this college who are either employed in Native States or have settled down there are doing very useful work. One of them Mr. K. R. Sankar has under the auspices of the Pudukotta Agricultural Union been publishing a weekly Agricultural Journal.

MEMBERSHIP.

Besides the 18 Patrons referred to in the previous report three more, Diwan Bahadur Sir P. Thegaraya Chettiar, B. A., M. L. C., Madras, M. R. Ry., V. Arumugam Pillai Avl., of Sundakaputhur, and Khan Sahib Haji Abdulla Sahib of Udipi, have become our Patrons for which we express our thanks. The present strength of the Union is, Patrons 21, 1st Class Members 69. Ordinary members 371.

It is a matter for gratification that gentlemen taking interest in Agriculture are increasing in number in the Local Legislative Council and with our Patrons already there of whom the Educational Minister the Hon'ble Rao Bahadur A. P. Patro Garu is one, the Council should be largely conversant with the work of the Department and help it to improve the status of the ryot.

AID TO STUDENTS.

From the limited funds at its disposal the Union is rendering pecuniary help in the shape of a loan to student A. Sivarajan of Class III.

BUILDING FUND.

We beg leave to remind our members of the appeal made in December last towards donations for the construction of building to house the Union. We regret, however, to note inadequate response from the bulk of the members though 18 more have signed the list and two have already paid. We request the members to liberally contribute towards the fund so as to bring into existence a building worthy of the traditions of the Union.

We thank the Coimbatore Amateur Dramatic Club for their gift of side screens in addition to a money present of Rs. 52/8, the savings from the performance enacted by them here in the College.

We sincerely regret that owing to unavoidable circumstances January to June issues of the Journal could not be published. The committee hopes that next year its publication will be more regular. In this connection, the committee begs to add that arrears of subscription for both the Journal and the membership of the Union have during the past few years totalled up to about Rs. 1,700—0—0. The commitee have taken steps to realise this amount and requests that arrears may be kindly paid up, so that the finances may be placed on a stronger basis.

JOURNAL.

Before concluding the committee begs to express its warm thanks to Mr. R. C. Wood, the President, and Mr. H. C. Sampson, the Director, for their continued interest in the Union and the auditors Rao Sahibs M. R. Ramaswamy Sivan and T. S. Venkataraman and Mr. Sundararaman who acted during the absence of the latter.

K. T. BHANDARY,
General Secretary.

Statement of receipts and charges of the Madras Agricultural Students' Union 1920—21.

Receipts.

PARTICULARS.	Rs.	A.	P.
Opening Balance on 1-12-20. ...			
By Subscription from Members and Patrons under permanent fund ...	250	9	7
,, Subscriptions under Journal Account ...	1291	13	7
,, Donations for the College Day ...	464	12	9
,, Donations for the Building Fund ...	460	0	0
,, Miscellaneous ...	50	0	0
	52	8	0
	2569	1111	

Charges.

PARTICULARS.	Rs.	A.	P.
Expenditure from the Permanent Fund ...	222	1	0
,, towards the Journal ...	1006	6	0
,, towards the College Day 1920 ...	600	5	9
,, Cash on hand including the amount in the Current Deposit in the Urban Bank ...	740	15	2
TOTAL ...	2569	11	11

Finance of the Union.

By Fixed Deposit in the Urban Bank ...	1200	0	0
,, Advance with the Printer ...	300	0	0
,, Advance with the Clerk ...	10	0	0
,, Loans yet to be recovered from the Students Excluding the interest. ...	450	0	0
,, Cash on hand ...	740	15	2
TOTAL ...	2700	15	2

Audited and found correct by
Messrs. Rao Sahib M. R. Ramaswami Sivan Avl.,
S. Sundararaman. 17-11-21.

(Sd.) V. Ramanathan,
Treasurer.

Receipt.	Amount. Rs.	A.	P.	Charges.	Amount. Rs.	A.	P.
Permanent Fund.							
Subscription from Members ...	203	0	0	Loans to Students ...	105	0	0
Donation from the patrons ...	500	0	0	Stationery and telegram charges.	2	1	0
Loans returned by					107	1	0
Mr. S. Kuppusamy Iyangar 247—13—4				Cost of Type-writer ...	115	0	0
Mr. M. Venkatarangam 50—0—0							
Mr. P. Lakshminarayana							
Mr. Achutaramayya 105—0—0							
	502	13	11				
Interest on the Fixed and Current deposits	75	15	8				
Subscriptions from Associate Members	10	0	0				
	1291	13	7		222	1	0
Journal Accouts.							
By subscription for Vol. IX & VIII	429	12	9	Establishment charges ...	155	4	0
Advance subscription to Vol. XI.	14	0	0	Printing charges ...	750	0	0
Advertisement charges ...	19	0	0	Stamps and V. P. charges ...	93	11	6
Miscellaneous ...	2	0	0	Miscellaneous ...	7	6	6
Total ...	464	12	9	Total ...	1006	6	0

Receipt.	Amount. Rs.	A.	P.	Charges.	Amount. Rs.	A.	P.
College Day Account.				**Sports**, Decorations, Prizes, Medals fitting up of tents ...	226	5	9
By sale of rosettes	73	8	0	Rosettes and repairs to Volunteer Badges ...	34	11	6
By donations	386	8	0	Group Photo ...	20	0	0
				Drama and Stage fittings. ...	116	9	6
				The Union at home ...	178	2	6
				Stamp and Telegram charges ...	15	10	6
				Stationery & Printing ...	4	8	0
				Miscellaneous ...	4	6	0
Total ...	460	0	0	Total ...	600	5	9

Welcome Address.

By Mr. Wood.

Ladies and Gentlemen,

Once again, I find myself as Principal of this College and President of the Madras Agricultural Students' Union in a position to utter the official words of welcome to our numerous visitors. Those who know me will I trust believe me when I say that that welcome is not only official, but in most cases a personal one, though it often is not possible for me to show it, in the crowded days, we have before us.

I may perhaps be pardoned on this occasion for opening my address of welcome on a personal note. I have been looking up the accounts of the previous ten conferences, held under the auspices of our Union, in this hall and I find that it has been my privilege to deliver this welcome address at no less than seven of them. In fact, at our eleventh conference we have such an extensive past, that I think you would be interested to hear something of it.

The first conference was held in July 1911 and was apparently a small affair. At the second our President was Sir John Nathaniel Atkinson, and it is interesting to notice the fact that the then Acting Director of Agriculture was Mr. Sampson. I note also that an excellent practice prevailed at that conference, which has now been dropped. I was allowed to deliver my remarks after the President elect had opened the conference and finished

his speech. At the next conference Sir Harold Stuart presided, while this chair was occupied by Mr. Sampson, who was acting Principal in 1913, when I was away on short leave. During the next three years, we were honoured by Mr. Buckley, of the Board of Revenue ; Sir Fairless Barber, the Planting Member of Council, and Sir Alexander Cardew, a Member of Government. Among the distinguished visitors at the last, the seventh conference, I note our present President elect Mr. MacMichael, who was then, if I mistake not, occupying the position of the Collector of Coimbatore.

The eighth conference was notable in that His Excellency the Governor, Lord Pentland, was our President elect. He was accompanied by a number of Rajahs and Zemindars and I may recall to you that it was in that year that our very good friend Mr. Vengail Krishnan Nayanar founded the Pentland Scholarship and that on the suggestion of Lord Pentland himself the Tutorial system was introduced.

The ninth conference marks a change in date. College Day had till then been in July, the 14th of that month being the day the College was opened in 1909, by His Excellency Sir Arthur Lawley. This was inconvenient for the sports as new students had barely settled in, while it was not the best time for visitors to find opportunity to visit the college, nor was it the best time for them to see the crops on the Estate, nor was the weather usually so agreeable. For these reasons the College celebrations and the conference were shifted to coincide with the

presentation of Diplomas and to make in this way that combination of business and pleasure in which we are now involved.

That conference I attended in the comparatively unimportant, for that day at any rate, post of Director, Mr. MacRae being Principal at the time. Mr. Couchman, whose connection with the Department dates back to the earliest days, was the President elect.

The next conference that of last year was presided over by Sir P. Theayagaroya Chettiar, with Dr. Norris, in the Principal's chair. One of the most welcome guests at that conference was the late G. A. D. Stuart and I feel that I cannot let the occasion pass without paying some tribute to his memory. I knew Mr. Stuart probably better than any one in this Department as he lived close to where I did in England, and on two occasions we foregathered when on leave. I little thought that when I saw him off on his return to India last year that it was the last time I should see him. I also had opportunity for seeing Mr. Stuart's work when I acted for him as Director, on two occasions, and I can assure members of this Department that we have lost a good friend, and the Department is the poorer by his loss. He worked wholeheartedly and devotedly for the service, though he was not one of us, and I trust that opportunity will be found for perpetuating his memory in this Department in some appropriate form.

And this brings us to the present conference, when we welcome again Mr. MacMichael, who has kindly consented

to tear himself away from the busy atmosphere of the Board of Revenue, to assist us in our deliberations. That Mr. MacMichael has qualifications as a farmer, I know. He will perhaps remember that the first time I met him, when I called on him in the Collector's bungalow at Chatrapur in Ganjam, he vouchsafed the information that the cap he was wearing was made of wool, shorn from his own Scottish sheep and dyed, spun and woven into cloth on his own ancestral property ; it was in fact Khudder of the most approved kind !

So much of the past and the present. What of the future ? You will perhaps expect from me some statement of the changes which are being made in the teaching given in this College —at any rate, those of you who are students will. Firstly we must thank the Government for the generous way in which they have allotted funds for the New Teaching Building, which is rapidly arising to the South West of the present block which will I hope greatly improve the standard of the instruction we are now giving. Nextly, it is, I suppose, a matter of common knowledge that this College has applied for affiliation to the University of Madras, and I have just heard that a Committee of inspection has been appointed, consisting of Rao Bahadur K. Ramunni Menon and Mr. Sampson, and will be visiting this College. I feel confident that the results of that inspection will be favourable. We shall then in due course become affiliated to the University and students who succeed in their College Courses will be able to write after their names the magic letters B. Sc. in Agriculture. It is probable, mind I only say

probable, that special arrangements will also be made to enable the A and B classes at present in the College to obtain these degrees.

What is to be said of the change? Like most changes it has its good and its bad points. I personally shall be sorry to see the passing of the Old Diploma, but there is no doubt that more value is placed on a University Degree and I welcome anything which adds reputation to the College of Agriculture, Coimbatore. But let me warn students that the greater and the more worth winning the prize, the harder must be the struggle to obtain it. There will be no allowances for weaklings in the new Examinations; class marks and practical work will not count, as they do here, for the position, a student obtains, and if the successful ones obtain a superior title there will doubtless be less, of them to obtain it.

Ladies and Gentlemen my time is up and I have yet said nothing about the Union. I feel however that the Secretary who is shortly to read the Report, will give you the usual uninteresting account of that steady general progress, which the Union has shown in the past.

Once more I wish you welcome, and trust that your visit here will combine both pleasure and instruction in no common measure.

Mr. MacMichael's Presidential Speech.

I should like in the first place to express my deep appreciation of the honour the Director of Agriculture has done me in asking me to preside at this conference. All

officers whose good fortune it has been to serve in Coimbatore welcome every opportunity of revisiting a district which has always had a high reputation for sober common sense, and which, I rejoice to know, has worthily maintained its reputation during these days of storm and stress. For myself the pleasure seems to increase with every visit, and I am delighted to see so many old friends here today.

The aims and objects of the Agricultural Department and of the College and Research Institute here are well known, and I do not propose to provoke your patience by piling up ponderous platitudes on the point. Briefly, your work is to supplement by experiment and research and by practical tuition the hereditary skill and aptitude of the people,—in fact to apply science on a large scale to the study and practice of Indian Agriculture. It is quite true that the Indian ryots, and may I say the Coimbatore ryot in particular, knows as well as any peasant in the world how to make the most of the soil and the fruits of tillage. But his greatest admirers cannot pretend that he knows much of scientific discovery or experiment.

I had a few days ago the advantage of—I am afraid—a somewhat superficial perusal of the Administration Report of the Department for last year. May I take this opportunity of associating myself with the tribute paid by Mr. Hilson in that report and by Mr. Bhandary and by Mr. Wood today to your late Director Mr. G. A. D. Stuart. His untimely death was a very great loss not only to the Agricultural Department but to the whole Presidency.

I should like to congratulate all the officers of the Department on the steady and satisfactory progress made during the past year. The ramifications of the department are becoming so numerous that one can only refer to a few points out of a report that is full of interest from first to last page. When under the head of "Economic Botany—Paddy" I read that a new strain of the local Coimbatore variety Samba gave an increased outturn of 15%, and other new strains increases of 15, 12 and so on; or, again, when under Mycology I find that by spraying vines in Madura district at a cost of some 180 Rs., the result was a crop of grapes worth some Rs. 3000 more than the previous years crop, I realise to some extent what a great work this Department is doing and what tremendous possibilities lie before you. I sincerely hope the Legislative Council will also realise these facts and will vote you all the funds required for the satisfactory development of the Department with the same unanimity with which, I am glad to say, it votes money for one of the branches of the Administration for which I am at present responsible.

And mention of the Legislative Council brings me to "the middle of my song" and to a subject on which I wish to say a few words to you today. It is just a year ago since a substantial step was taken towards the realization of responsible Government in India and since with the assumption of office by the present Ministry in Madras a new and important chapter in its political history was opened. The manifold advantages of a democratic form of Government are so well known that I shall not weary you by attempting to enumerate them; but one obvious advantage from

your point of view I may mention. It is your good fortune that today the Agricultural portfolio is held by a Minister who is himself a practical agriculturist. But many though the advantages of the new form of Government may be, I take it that no one now-a-days is so early-Victorian in his views as to imagine that democracy is the ideal form of Government in *all* respects. I dare say it is quite true that under the old regime the fetish of efficiency played too great a part and threw into the shade other considerations that deserved to have greater weight attached to them ; that too little regard was paid to the importance of developing a sense of responsibility amongst the various agencies of Government, and insufficient weight was given to local sentiment and tradition. As a member of that "hoary institution" which, to quote from a recent appreciation of the Board of Revenue, in a Madras news paper, "represents the quintessence of Civilian experience and wisdom ; and is the repository of Civilian conservatism and prejudice."..... I say, as a member of that hoary institution I suppose I ought to assume the role of *'laudator temporis acti"* and shed a tear or two over the good old days that are no more. As a matter of fact I have neither time nor inclination for any such vain regrets or tears. But I do wish to warn you of a real danger to which you will be more exposed in the future than you have been in the past. Briefly I may call it the danger of substituting "eyewash" or showy work on paper for the honest unostentatious work which has been your guiding principle in the past ; for, as Mr. Couchman truly said two years ago. it has never been the fashion of the Agricultural Department to advertise itself.

Perhaps I ought to explain a little more clearly what I mean by eyewash. I shall do so by taking a case within my own experience. Some years ago the Department was trying to boom what were called informal village panchayats; and of course I was doing my best to work them up in my district and to impress on my Divisional Officers the importance of the subject. In one division I noticed from reports received that these panchayats were springing up like mushrooms after a shower of rain; they were as numerous as certain insects in most railway carriages in this country. I looked into the matter a little more closely and enquired what exactly had been done. I learnt that the panchayatdars had been duly appointed and the fact had been intimated to them; the panchayats were all reported to be working smoothly; but, though six months had elapsed, not a single meeting had been held by any of them. That, gentlemen, is what I mean by eyewash. It is true it looks well on paper and it may bring you promotion and honours-though in the case just mentioned it brought to the official concerned neither the one nor the other—but it will bring you no real satisfaction. The temptation to substitute eyewash for efficiency is much greater under a democratic form of Government; but for a scientific Department like yours to yield to the temptation will be absolutely fatal: and it will be a bad day for the Agricultural Department when the true scientific spirit becomes as rare in it as the old Highland spirit is in my native land to day.

For myself, the result of my experience in this country for 27 years is to leave me a confirmed optimist as to its

agricultural and economic prospects. We shall never, I suppose, be free from the croakings of that school of pessimists which is always proclaiming to the world the sad and increasing poverty of the Indian ryot—without, by the way, doing very much that is practicable to remedy the evils of which they complain. Certainly let us not shut our eyes to the poverty and misery; but let us be honest enough to admit that there has been an enormous improvement, that there is everywhere more money in the country, in investments, in deposits, and in the pockets of the people; that the wages of the working man have risen, that the standard of living amongst the poorest has gone up and that they employ conveniences and even luxuries which a quarter of a century ago were undreamed of. The Madras Agricultural Department may well be proud of the part it has taken in the past in bringing about this improvement; with the traditions which it already has behind it and with its present personnel, I look forward with full confidence to its producing still greater results in the future.

Agricultural Bacteriology.

By Mrs. Dorothy Norris, M. Sc., A. I. E.

One of the outstanding agricultural problems of the present days is the question of manures.

In western countries where mechanical power is rapidly replacing that of animals, supplies of natural manure are quickly diminishing and the position is little better in this country where much of available farm yard manure is utilised for fuel. China and Japan on the other hand appear to have realised the gravity of the situation and conserve every scrap of human and animal excreta for use on the land.

In view of the foregoing it is therefore of great interest to note research work on artificial manures carried out by Hutchinson and Richards at Rothamsted So far as can be gauged at present this work has opened up fresh possibilities which may revolutionise the question of manuring in the near future, for its limitations should be very quickly disposed of now that the main problem appears to have been solved.

The process may be briefly described as follows :—

It consists in the bacterial fermentation of straw or other waste cellulose-containing material, in the presence of suitable nitrogenous compound.

The three essential factors are :—

1. Air supply,
2. Favourable temperature, and
3. Supply of suitable soluble nitrogen compounds.

The basic material is waste straw from any available source and this is fermented aerobically.

The temperature rises during fermentation to 65° C when the nitrogen supply is properly adjusted.

The reaction must be neutral or only slightly alkaline. Hence ammonium sulphate alone as a source of nitrogen is no use because the medium soon becomes acid.

Nitrogen must be present in an available or indirectly available form and must not exceed a definite amount both actually as well as in concentration e g. If ammonium carbonate from decomposition of urea is used and exceeds a certain limit the breakdown changes cease until the concentration or the alkalinity has been reduced by loss of nitrogen.

(a) If the straw is overloaded with nitrogen, loss occurs.

(b) If the exact amount is present the straw rots without loss.

(c) If the straw is undersaturated, nitrogen particularly in the form of ammonia can be picked up by the organism present.

The nitrogen appears to be stored in an organic or non-ammoniacal form.

The amount of nitrogen necessary varies from 0·70 to 0·75 parts of nitrogen per 100 parts of straw and stabilised product is obtained when rotting has proceeded to 40% which usually possesses a nitrogen content of 2% calculated on the dry material. Urea and ammonium carbonate have been found the most suitable carriers of nitrogen on a large scale, as they give a favourable reaction. They are however expensive. Cyanamide and ammonium sulphate may be used but the latter must be supplemented by a base. Hence future work should be directed towards the provision of cheaper sources of nitrogen. In preparing the straw for fermentation it is best to heap it and sprinkle with water and leave for 2 days when a further sprinkling may be given. When the interior is uniformly moist, the nitrogen may be applied in solution or broadcasted and watered in. The resultant manure is a well-disintegrated plastic material which closely resembles well-rotted farmyard manure and has so far given excellent results during trials.

At the same time although it is possible in this way to make manure without the intervention of animals, the process can be made to utilise liquid manure as the source of nitrogen, by allowing this to run through the straw under conditions which encourage the absorption of nitrogen compounds.

To turn from this to the many bacteriological problems connected with the soil itself, it is at once obvious that an immense field for work exists.

It is well known of course that the soil is inhabited by a great variety of micro-organisms but, we know very little about them either individually or in their relationship to growing plants although soil fertility is greatly affected by their activities.

The usual methods of investigation are extremely artificial, the organism is picked out and studied on arbitary medium, that is to say, it is brought under unnatural conditions the moment it is removed from its ordinary environment. The method has undoubtedly given useful results, but it is naturally open to defects. For one thing micro-organisms are considerably influenced by the medium in which they happen to find themselves and may react totally differently according to the conditions in which they are placed. In fact this method which may be termed the direct method has proved very difficult and has given good results only in the hands of a few workers such as Winogradski, Beijerinck and others.

The more useful methods in use are indirect and may be classified as follows:—

1. Use of various culture media arranged to bring out different groups of organisms. These are usually arranged to favour nitrification, ammonia production, nitrogen fixation and denitrification.

Here again the fundamental objection to the method is that the reactions are studied in medium very different from ordinary soil.

2. Counts of bacteria are made from soil suspensions suitably diluted on solid culture medium. This method is also faulty, because firstly no medium is known which will bring out all the soil organisms so that the results are always low and no medium even distantly resembles the soil in composition or structure so that the flora obtained on the plates does not necessarily reflect the flora active in the soil.

3. Chemical determinations of the rate of progress of the various changes going on in the soil—absorption of oxygen, evolution of carbon dioxide, production of nitrate etc.

If the second and third methods are used in conjunction useful results may be obtained. For example increases in bacterial numbers are so often associated with increased production of nitrate that one is justified in making the assumption that the phenomena are connected. This is not always the case however, for example, when ammonia-producing organisms are caused to multiply by partial sterilisation of soil, they do not increase the stock of ammonia and nitrates beyond a certain limiting amount.

On the other hand bacterial activity may show no sort of relationship with soil fertility, because there is some limiting factor other than nitrogen supply or rate of decomposition of plant residues.

The bacterial activity may on the surface appear to be directly related to soil fertility, but the relationship is accidental, both bacteria and plants being limited by the same factor e-g. by acid rain water in districts where there are chemical works.

The above outline indicates very briefly some of the principal methods by which soil bacteriological problems are attacked. Soil conditions have naturally a considerable effect on bacterial numbers and on flora generally and in this country with its vast extremes of climate interesting results are certain to be obtained as soon as data have been collected.

Bacteria being living organisms, it is natural to suppose that their activity increases with the temperature up to a certain point. The amount of nitrate produced does show this increase but bacterial numbers do not.

Increasing moisture supply also causes an increase in bacterial numbers but this is not regular and the rate of nitrate production rises to a maximum and then falls consequent on the lack of air caused by the saturation of the soil. Excess of water will of course also wash out the resulting nitrate from the soil.

The effect of added organic matter is to increase the supplies of energy and therefore to increase bacterial numbers, although whether nitrate supplies will be increased, depends on the proportion of nitrogen present in the added matter.

The effects of lime, calcium carbonate and magnesium carbonate have been studied and the results are somewhat contradictory. Where the work has been done on acid soils, benefit has naturally been derived from neutralisation. In neutral soils less concordant results have been obtained, some observers having observed detrimental effects from further addition of calcium carbonate, while others have obtained beneficial results—bacterial numbers, ammonifying power and nitrifying power all being increased.

Magnesium carbonate may be more effective than calcium carbonate in small quantities, but it is toxic in larger amounts. Lime in excess of a certain amount acts as a sterilising agent.

Enemies of bacteria in the soil.

I should like now to refer to a remark I made earlier about partial sterilisation of soils resulting in the increased production of ammonia producing organisms.

On the surface this would appear the direct opposite of what one should expect. As a matter of fact the apparent contradiction is resolved when one realises that the soil population does not by any means consist mainly of bacteria.

It was found that antiseptics in general first of all diminished the bacterial population and then led to an enormous increase in numbers and heat was shown to have the same effect.

Various chemical and physical explanations have been put forward to explain this, but they do not account for the facts.

Russell and Hutchinson consider that the soil population is complex and that some of its numbers act detrimentally on the

bacteria which produce plant nutrients. These detrimental forms are more readily killed than the useful bacteria with the result that the new population produces more ammonia and nitrate than the old one.

This view is still under dispute as some investigators do not admit the presence of any biological factor in soils detrimental to bacteria.

I have gone into the question of soil bacteriology in some detail in order to point out that almost the whole of the results so far have been obtained in temperate claimates, thereby indicating how much is to be worked out in the tropics.

Another aspect of Agricultural Bacteriology is that of plant disease.

It is now becoming more and more generally realised that bacterial diseases of plants are as common as any other kind.

This branch of Agricultural Bacteriology is a very young one, the first mention of a bacterial disease being that of pear blight about forty years ago. Since that announcement the subject has increased enormously and it is now generally realised that the distribution of bacterial diseases of plants is universal. This again is a subject which has not received a great deal of attention in the tropics and so again a large field for research awaits the attention of the investigator.

The commonest method of infection is probably through wounds in the plant either above or below ground. This indicates the care that should be taken in pruning and also shows the part which insects may play in the dissemination of disease.

At the same time it is possible for bacteria to infect plants through their natural openings such as nectaries, water pores and stomata.

Blossom blight of the pear is an example of the first, black rot of the cabbage of the second and angular leaf spot of cotton is mainly stomatal.

Plant diseases have many features in common with those of animals. There is usually a latent period or a period of incubation during which the disease establishes itself in the plant before it is serious enough to be recognised as such by the damage it does. Like an animal disease it may be thrown off without doing much damage, if the plant is under more favourable conditions than the parasite. Everything depends on whether the parasite finds the initial conditions entirely suited to its needs or can by means of its metabolic processes quickly make them so and thereby make rapid growth.

To illustrate the variation in the appearance of disease from time of infection, one can cite the various soft rots which usually appear in one or two days after inoculation and Cobb's disease of sugar-cane and Stewart's disease of sweet corn which may take one to two months. Of course as with animals the greater the initial infection, the shorter the time in which the plant succumbs.

I have already stated that diseases may be transmitted by insects—they can also be carried on the seed and thereby continue from one crop to the next or they may be carried in the soil itself, wind and water may also carry infection and possibly birds The case against the insects, molluscs and worms is complete.

I have no time to consider the prevalence and distribution of bacterial plant diseases but I should just like to touch on the methods of control. I may say at once in most cases these still remain to be worked out.

Where diseases are transmitted by seeds, bulbs or tubers and cuttings, the obvious remedy is to use these from disease—free stock.

Some seeds will stand treatment in various antiseptics but care has to be taken in the use of these as germination may be injured. Germicidal sprays and control of insects by sprays will keep certain diseases in check and disease-resistant varieties should be grown wherever possible.

Possibilities of Plant Breeding.

By M. Anandan, L. ag.

An attempt is made in this paper to show what a plant breeder can achieve in the field of Agricultural improvement, and on what particular principles he bases his methods for bringing about such improvement.

The necessity for such an attempt, though very feeble on my part, has arisen from the fact that there is a great deal of mysticism attached to this subject in the minds of even the highly educated section of the people of this country, as evidenced by the trend of the discussions that ensued on the motion for funds for the furtherance of this kind of work, during the last Budget Sessions of the local Legislative Council. The necessity for explaining certain salient features of such work becomes all the more insistent when one considers the fact that the future of such lines of work mainly depends upon the will of the legislature for providing necessary funds, as it is admitted on all hands that no useful investigation of any kind can be carried on, on definite and progressive lines, unless funds are forthcoming.

The specific subject that I allude to, for which a good many of the members of the Council showed great reluctance to vote funds, was the question of opening a Paddy Breeding Station in the Tanjore Delta during the current year. Some people, I am afraid, attach to the term "plant breeding" a meaning almost akin to the mere growing of any crop with a view to

supplying seeds in bulk without any reference whatsoever to the quality of the seed so supplied. Some others, I believe, imagine that the object of such schemes is to introduce the cultivation of a crop into localities that never grew it before. Though the ultimate aim of a Breeding Station may merge into one or both of the above objects, the primary and the most important object for which a Breeding Station exists, is for discovering or isolating superior strains of plants from varieties that are mixtures of good, bad, and indifferent individuals, and also for evolving new individuals that never existed before, by the method known as "cross-breeding."

The fundamental difference, in my opinion, between the aims of Plant Breeding Station and an ordinary agricultural experiment station is that the one tries to explore the possibilities of plants and the other, the possibilities of the different kinds of environment so as to establish the best medium for plants to grow and give their maximum yield. Each forms a separate member of an organic whole and in consequence is interdependent. So it is not within the province of a plant breeder to carry out any manurial or other cultural experiment station to evolve varieties or strains of any crop. Of course, in years that have gone by, when breeding-stations were not in existence, agricultural stations had to take on the work of the plant-breeder also, along with their legitimate work.

A plant-breeder is a creative genius in the sense that he tries to evolve certain strains of a crop which have in combination certain economic characters of value to man. Let me illustrate my meaning by taking an actual example from some of the results obtained by the Government Economic Botanist at the Paddy-Breeding Station on paddy which, among other things, ripens a fortnight earlier than other local varieties without sacrificing the yield in any way. That it really is an achievement of

real economic value can only be appreciated to its full extent by a man of Coimbatore, who knows how very disappointing the irrigation tanks are during seasons of scanty rainfall and how very advantageous it is to knock a fortnight off the duration of a crop in such situations. That this strain is really being appreciated and grown by the ryots in increasing numbers can be verified by an actual inspection of the crops now growing round about here in Coimbatore.

Let me now try to show you the ways in which a plant-breeder tries to effect improvement in a crop he deals with. As previously stated, isolation of pure strains or types from any variety of a crop is the foundation for all his work, because he cannot proceed further, unless the material he deals with, is pure. A variety as commonly understood is generally a composite mixture of distinct hereditary types or bio-types. Each one of these is marked by certain distinct hereditary characters, and if propagated separately, breeds true. These true breeding types are what are known as pure-line cultures. This method of isolating pure lines from varieties of a crop is the first step a plant-breeder takes, before he does anything else. When once he has isolated the true-breeding types, he tries to probe into their economic possibilities. He keeps a record of all the hereditary characteristics of each type, i. e., its height, duration, uniformity of flowering, ripening, fineness of straw, heading, size of grain, shape of grain, yield and various other characters which may turn out to be of economic importance under certain special conditions. It is easy to see that the field for selection of suitable strains for particular situations becomes wider, when the number of strains is large. Therefore, any addition of material to what already exists on the station is to be welcomed, because it increases the scope of the work.

Before leaving this subject of isolation of pure breeding types, I may be permitted to state something about the crops

grown by the ordinary ryot. It may be taken, as a general case that you will not be able to come across a single field that has on it pure crop in the strict sense of the plant-breeder. When field crops are mixtures of various hereditary types, as they unfortunately are in most cases, it will be idle to expect all the individuals in such a population of plants to behave exactly alike. Each one type will have its own height, duration, yield and other habits so that it will not be possible to get a uniformly maturing crop, or even the maximum yield that is possible, if the high yielding type among the various types forming the crop, were the only one grown instead. It is exactly here that the plant-breeder's pedigree cultures or strains score over the farmer's unselected varieties. After securing pure lines, he proceeds to find out the promising ones among them by what is known as comparative trial of these strains under suitable arrangements so as to keep down as low as possible the experimental error involved Such trials are further repeated for several seasons so as to eliminate the effect of seasonal variations in different types The strains that come out successful through such tests and maintain their superiority intact are multiplied in sufficient quantities and given out to farmers for growing as their bulk crops. These strains in time replathe unsoe elected varieties that the ryots were growing before. Judging from the results so far obtained with paddy, wheat, and other crops by the application of this one single method of isolating superior strains from them, it will not be an over-estimate to state that the yield of the several crops that are largely grown in this country can be raised at least by 10 per cent. over what is obtained at present. What this 10 per cent. increase exactly means in the aggregate, will be apparent if we take into account the actual area under these major crops. Nearly 25 million acres are under cereals alone in this Presidency, of which paddy claims about half.

But when once a pure line is isolated and fixed it is not possible still further to increase its yield by any more selections from it.

The second method, and by far the more important and far reaching of the two in its results, is what is technically known as "hybridisation or cross-breeding." Though this method was practised by breeders in various countries for a long time, the true significance of the principles involved in crossing the individuals which differ in one or more hereditary characters came to be understood only comparatively recently. In fact it was only towards the close of the last century that the true interpretation of the behaviour of hybrids and their progeny in succeeding generations was offered in a way that was at once convincing and mathematical in its accuracy. The whole credit of the discovery of the principles involved goes to an Austrian monk named Gregor Mendel, so much so, very rightly, the principle of heredity since his time is commonly known as 'Mendel's Law of Heredity.'

I do not propose to trouble you with the details of the crosses which Mendel carried out between various kinds of edible pea, the behaviour of which and whose progeny in succeeding generations gave him the clue to the real state of affairs that occurs when two individuals differing in one or more character pairs are crossed together. I shall merely state the truths he discovered and try to show you what bearing they have on the question of plant as well as animal breeding. The following are some of those facts:— 1) an individual, whether a plant or an animal, is distinguished by various heritable characters and each of these is a unit in itself and is independently transmitted from parents to offspring. (2) The opposing characters that come from the two parents from what Mendel called a character pair or an allelomorphic pair. As examples of these character pairs, I may give the following few:—Tall and dwarf stature of some plants; black and white colour; hornless and horned character of certain breeds of cattle; round and wrinkled nature of certain seeds;

starchy and glutinous nature of rice; pigmented and non-pigmented nature of certain plants. (3) As the sexual cells viz., the sperm and the egg are the only material contributions from parents to the offspring, it is reasonable to suppose that the material, whatever it is, that is responsible for the reproduction of the parental characters in the progeny must be present in these cells. So Mendel naturally concluded that a sexual cell carries a something (now known as a factor) for each character of the individual. As a corollary to this it follows that a sexual cell will have in it, at least, as many factors as there are unit characters in the individual, if not more. (4) In many cases it is noted that the hybrid exhibits either one or the other member of any character pair. The member so exhibited in the cross he called a 'dominant' and that which failed to so appear as the 'recessive' character. (5) Whatever may be the appearance of the hybrid, whether it looks exactly like one of its parents, or is an intermediate in appearance between the parents or is a totally different individual from either of them, one fact is common to all hybrids, that the members of each character pair segregate when a hybrid organism produces its sexual cells so that half of them would contain one and the other half, the other member of the allelomorphic pair and none of them, both. This last is what is known as the gametic segregation theory of Mendel and forms, in essence, the corner stone of the whole question of heredity. It is in the enunciation of this great principle that Mendel made his mark as a profound thinker. I shall try to give you, by way of illustration, a simple case of segregation of characters. When a tall plant is crossed with a dwarf one, the resulting hybrid has brought into it a factor for tall habit from the tall parent and a factor for dwarf habit from the dwarf parent. It is immaterial whether the hybrid plant looks exactly like one of the parents or not, for the appearance of the hybrid does not in any way affect the assortment of the

factors for the two parental characters when such a hybrid plant produces its sexual cells. 50 per cent of both the pollen grains and ovules will contain only the factor for tall habit and the remaining 50 per cent of them the factor for dwarf habit. Now when such a plant is allowed to self-fertilise, there is an equal chance for a pollen carrying the factor for the tall to fertilize an ovule carrying tall or dwarf factor. If the former event takes place a pure-breeding tall is the result and if the latter, a hybrid individual will be the result. Similarly a pollen grain carrying the factor for dwarf habit has a chance of meeting either a tall or dwarf carrying ovule. In the first case, a hybrid will result and in the latter a pure breeding dwarf will result. From the above chance mating we get the original parental forms namely tall and dwarf, and in addition hybrids between the two. From the above example we can draw the conclusion that when the material and the paternal contributions are similar for any character, the offspring resulting out of such a mating will be pure as far as that particular character is concerned; when such contributions are dissimilar, a hybrid progeny is the result. This fact of the segregation of parental characters alone is not enough to give the breeder a hope for improving his crops or animals. For instance, if in all cases characters coming from one parent were to remain together in one half of the sexual cells and those coming from the other parent, in the other half it will be next to impossible for us to combine the parental characters into one individual that will breed pure for them in succeeding generations. There are really cases of this nature. To give you an example from paddy:—Two strains of paddy one having a purple internode and green glume, and the other, a green internode and a purple glume, when crossed together, gave a hybrid having purple internode and purple glume, due to the dominance of purple. But when seeds of this hybrid plant were grown again, it was found that the two parental forms alone, were

reproduced, in addition to the hybrid full purple plant. We have not been able to get a plant with green internode and green glume at all, nor a purple internode and purple glumed plant which bred pure, though during the past few years thousands of plants out of this were cross grown. In similar cases it will be merely a waste of time and energy in trying to breed individuals with new combinations. Fortunately for us, as shown by Mendel, the situation, generally speaking, is different from this. He had been able to show that factors for various characters, irrespective of the parents from which they come, are capable of re-combination in the second generation of a cross in all possible ways so long as such factors do not belong to the same allelomorphic system as previously explained.

To make this clear, I shall give you an example. Suppose a black hornless bull is mated to a red horned cow, the offspring will be black hornless animals, due to the fact that black colour and hornless condition are dominant characters. When such black hornless hybrid animals are mated together, we get four kinds of individuals. (1) Some black hornless animals as one of the parents. (2) Some horned reds as the other parent. (3) Some horned blacks and (4) Some hornless reds. These last two are two new combinations of the parental characters. These new combinations are made possible because of the production of the following four kinds of germ cells with factors (1) for black colour and hornless nature (2) for black colour and horned nature (3) for red colour and hornless nature and (4) for red colour and horned nature.

In the same way, Professor Biffen in England has been able to combine the rust resistance of one variety of wheat and the high cropping power of another into a new individual. What this actually means to the wheat-grower, and how profoundly it can affect the total out-put of wheat in the whole world, if this method

is followed up everywhere, will be realised when it is known that rust on wheat alone causes more loss than all other fungoid diseases on all cereals put together. I hope the Government Mycologist will be able to bear me out here.

Pursuing the same line of work as above it may not be too much to hope, that in time it may be possible to breed strains of highly-yielding paddy or ragi that will be immune to the attack of blast which is another very destructive form of fungus that attacks paddy and ragi.

Here is another example of a second generation (F-2) of a cross between the well-known strain number 24 of the Government Economic Botanist and a Java variety of paddy which is tall-growing and characterised by a long gracefully drooping earhead set with very big grains. 24 is a short plant with open earhead and very fine medium rice. In the second generation (F-2) which I am now showing to you, you will notice that it partakes of the length of Java parent and the open nature and small grain character of strain 24. There are various other combinations of parental characters that are visible in this as well as in other crosses in paddy. I can only suggest that those that are curious to know more about this aspect of the question of breeding, will visit the Paddy Breeding Station one of these days, and I can assure them that they will be amply rewarded for the trouble.

An important truth that has been observed by breeders in various countries is that the hybrid is always more vigorous than either of the parents and in consequence more productive. This fact has been taken advantage of in increasing the outturn of such crops where hybrids are easily obtained in sufficient quantities for growing as bulk crops. One case is that of maize breeding in America. Cross-fertilization is the general rule in maize. What they actually do is to grow two strains of maize in alternate lines in sufficiently large areas and detassel completely any

one of these strains so that cross pollination is the only course open to such plants to develop their cobs. This practice ensures that all the seeds developed on the detasselled plants are necessarily hybrids. These hybrid seeds are given to farmers for growing as their bulk crops. Production of such hybrid seeds will have to be carried on, year after year, on an increasing scale to meet the demands of farmers and it has been found after a series of experiments that hybrid seeds give much higher yield than any of the pure strains used as parents in such crosses.

So far we have been dealing with the plant as such without any regard to the environment, but the story will not be complete if we omit to mention something about it, because it is the environment that gives a chance for the highest expression of the hereditary peculiarities of any organism. It may act as a help or a check to the expression of the potential characters of the organism. Environment is as complex as the organism itself and is determined by various intricate soil factors in combination with the meteorological elements as solar insulation, clouds, rain, wind, dew etc. All these factors, forming what we term the environment of a plant, act and react on the plant. Different plants respond to the same environment in different ways, and the converse also is true. That this is the case has been amply proved by the failure of plants to develop to their full stature when transplanted from one locality to a widely different one. Perhaps it may be due to the very favourable environmental conditions of soil and climate that the paddy plant in Spain is able to produce on an average 6,000 to 7,000 lbs of grain to the acre. From aught we know these Spanish varieties if grown in India, might not give the same yield. But the subject deserves closer study and it would be worth while, I think, to study the conditions under which paddy is cultivated in Spain and find out if the factors contributing to such high yield are controllable by man and obtainable here. This question of environment and its effects on plants leads us to the question of improving local varieties of crops in the localities themselves. It is no use producing a very good strain in Coimbatore and trying to grow it in

Godavari or Malabar as we know the conditions of soil and climate in those tracts are radically different from those of Coimbatore. It is for this very important reason that sub-stations in different parts of the country, in addition to the Central Station, are considered highly essential; because it is only then that we will be in a position to bring into practical use, on a largely extended scale, the results of the very painstaking research work done at the Central Station. A Central Breeding Station, I consider, should function as a clearing house for precise scientific information for men engaged on the sub-stations.

Before concluding I beg to express my humble thanks to Mr. F. R. Parnell, M. A., the Government Economic Botanist, under whom I have the privilege to work, for the very valuable suggestions he offered me for making this paper as far as the nature of the subject would permit, a popular one and also for permitting me to make use of some material from the Paddy Breeding Station and the services of his artist, Mr. Alwar Ayyengar, to whom I am indebted for the diagrammatic representations of the cross between the black hornless bull and the red horned cow.

Discussion.—

Mr. C. Tadulinga Mudaliar supplemented Mr. Anantan's observations on the Possibilities of Plant-breeding, by quoting his experience with G. E. B. No. 24, a new strain of "Kichili Samba" paddy produced at the Paddy Breeding Station. Struck by the excellent quantities of this strain, he introduced it in small quantities into his village near Ponneri in Chinglepet District, where he declared, it had now become so popular that it was fast replacing other varieties.

Mr. S. Sundararaman spoke on the importance of plant-breeding in combating certain fungoid diseases of plants and remarked that the strain—G. E. B. No. 24—referred to by the previous speaker was according to his own observations, resistant to "Paddy-blast." He indicated similar lines of work in the checking of other diseases of paddy such as Ephelis and "blackstick" and of the leaf-fall disease of Rubber.

Some difficulties in conducting varietal tests of Paddy.

BY G. JOGI RAJU, D. A.

There was a time, when, for a varietal or manurial test, a paddy field was divided into a number of square or rectangular plots according to the shape of the field, each variety or manure under trial occupying a plot, or sometimes two. The bigger the area of the plot, the more accurate was the result considered to be. Owing to the frequent irregularities and inconsistencies noticed in the results, however, it was later on found advisable to increase the number of plots under each variety or manure, the average of the results from a large number of plots having been considered more reliable than those from a single plot or two. In course of time, a method of testing the reliability of the results of an experimeut by calculating its 'Probable error' was also brought out. It was also found that, to minimise 'Probable error' it is necessary, not only to select as even a piece of land and to have each variety or manure repeated on as large a number of plots as possible, but also to have the plots as long and narrow as practicable. Experimental work has thus gradually settled down on a reliable basis, empiricism having given place to precision.

Though reliable lines of conducting experiments have thus been evolved, there are yet several practical difficulties met with in laying them out to perfection. An attempt will be made in this paper to briefly narrate some of the difficulties confronted in conducting a varietal test of paddy on the Samalkota Agricultural Station during the past two seasons, and to make a few suggestions towards their solution, with a hope that from the discussion which will follow, orrect lines for future work will be arrived at.

In testing the productivity of different varieties of paddy, three chief factors, besides the unevenness of the land, which as already indicated, tends to show a high 'probable error' interfere with results viz., the spacing of the plants in the plots, the fertility of the soil, and the nature of the season. How each of these affects the results will be explained below.

Spacing. The productivity of any variety of paddy may be judged either from the average yield of a large number of individual plants or from the collective yield of a mass of plants in a unit of area. It is doubtful if both mean the same thing. If both be found always to go together, varietal tests become pretty simple, and a number of lines of each variety planted side by side sufficiently wide (say about 1½ ft. from line to line and plant to plant) and repeated several times will suffice. If, however, the two do not go together, and as the practical cultivator judges his varieties only from their collective yield, we are to test them for this alone, these tests become more complicate.

The yield of any variety from a unit of area depends upon the number of ears that are produced from that area and their size, judged by the average weight of sound grain in them. There is an optimum spacing for each variety under which the number of ears produced and their average size tend to the largest yield per unit area under a certain set of soil and other conditions. Experience tells us that, under normal conditions—Garikasannavari a variety which has a comparatively light ear, even under wide spacing, generally gives high yields when closely planted (about ½ link apart), while Palagummasari which has a heavy ear does best under wide spacing (about 1 link). It is not therefore proper to compare varieties with such different habits under the same spacing. It therefore appears necessary to determine the optimum spacing for each variety and adopt that spacing for that variety. But this optimum spacing again, as already indicated, varies with the soil and seasonal conditions, so that the optimum determined in a certain field or in a certain season does not hold good for another field or season. It therefore becomes necessary to adopt 2 or 3

different spacings with each variety every year so that each variety will have a chance of having a spacing as near the optimum as possible under the soil and seasonal conditions obtaining.

On the Samalkota Agricultural Station 15 varieties-five early, five medium and five late are under comparison and with the above view, three spacings $\frac{1}{2}$ link wide, (or 4000 plaints per cent), $\frac{5}{7}$ link (or 1960 plants per cent) and 1 link (or 1000 plants per cent) are adopted, the early and medium varieties being compared under $\frac{1}{2}$ link spacing in one field, the early, medium as well as late varieties under $\frac{5}{7}$ link spacing in another field and the medium and late varieties under 1 link spacing in a third. Each plot is 100 links X 5 links or $\frac{1}{2}$ cent in area, and each variety is repeated 8 times. In this arrangement of the plots the yields of the different varieties are comparable for each spacing separately, but the yields under one spacing are not comparable to those under another spacing, as the plots under different spacings are in different fields which may differ in fertility or be more or less favourably situated with reference to irrigation, drainage etc. No field on the farm is large enough to accommodate all the plots under the three spacings and even if there were one, it cannot be expected 'to be uniform enough to admit of the results showing a reasonable probable error.'

To get out of the difficulty two courses may be suggested. One is to select one or two standard varieties and compare the other varieties in small groups, the varieties in each group being tried under all the three spacings in the same field, and to apply the axiom 'things which are equal to the same thing are equal to one another.' Another is to have, among the present series, plots of one or two standard varieties under the same, preferably medium spacing so that the relative fertility of the soil with reference to the standard variety may be gauged and the yields of the plots of the three fields corrected to one standard of fertility.

2. *Fertility of the soil.* Apart from the evenness of the soil as regards its fertility, its richness or poverty, though even, may affect

the results of varietal tests considerably. A varietal test on unmanured land is likely to favour late and medium varieties against early varieties. On a heavily manured land, the early and medium varieties may sometimes have an advantage over the late ones which are liable to lodge before earing. Is the land on which we conduct varietal tests therefore to be manured or not? If it is to be manured, to what extent and with what manures? It would probably be better to make varietal tests under fairly heavy manuring, with fish guano, or standard mixture of some oil cake and bone-meal or superphosphate, the quantity applied being what a ryot can profitably be expected to use. Under fairly heavy manuring, the varieties undergo a real test as to their responsiveness to manuring. Those which lodge before ripening when thus manured, may soon be eliminated, our chief object in testing the different varieties being to get at those varieties which respond to good cultivation and manuring and are therefore capable of giving as high and remunerative a yield as possible.

If however a varietal test is started with the idea of selecting varieties which do well with little or no manure, such a test may be conducted on unmanured land.

The nature of the Season. Differences in the seasonal conditions affect the results of our varietal tests considerably, certain varieties doing best under certain conditions. In some varietal tests carried on, on the Samalkota Agricultural Station from 1912—13 to 1917—18, of 17 varieties tried, 5 gave their maximum yield in 1912—13, while 12 gave their maximum yield in 1914—15, the yields being poorer in the remaining years.

Figures for 4 of these varieties are noted below :—

	1912—13,	1913—14,	1914—15,	1915—16,	1916—17,	1917—18
	lb.	lb.	lb.	lb.	lb.	lb.
Rasangi ...	3620	3255	3711	2148	2750	2190
Konamani ...	4062	4027	3880	1944	2060	2100
T. S. Akkulu ...	2187	3102	3704	1800	1660	2660
Ratnachandi ...	3370	3671	3848	1628	1870	2220

The following figures again show how great is the variation in the yield of of certain varieties, even when grown year after year in the same plot, left continuouly unmanured.

Year.	Samalkota Agricultural station (Konamani.)		Palur Agricultural station Ramagarudan Samba		Remarks.
	F No. 9.	F No. 8.	58 D.	58 H.	
	lb	lb	lb	lb	Figures for grain only are noted.
1908—09	,,	,,	2068	1432	
1909—10	2075*	2680	1320	1920	
1910—11	1740	2080	2112	3028	
1911—12	2510	2720	2464	2952	
1912—13	3085	3524	2354	2886	
1913—13	2948	3540	1986	2955	
1914—14	3655	3628	2116	3072	
1915—16	2985	3154	2760	2992	
1916—17	,,	,,	3876	4314	
1917—18	,,	,,	2616	3168	
1918—19	,,	,,	8060	4392	
1919—20	,,	,,	1992	2448	

* yield per acre.

To gauge the productivity of any variety, therefore, it will be necessary to try it for a number of years, to give it a chance of doing its best. Moreover, though we are not yet in a position to foresee or alter any of the seasonal conditions, a careful study of the seasonal effects on the different varieties enables us to change the variety or the method of cultivation at least when the conditions previous to transplanting indicate such necessity. Last summer, for instance, was very severe in the Northern Circars, the maximum temperature having risen up to 118 F on the Samalkota Agricultural Station. There was also no rain during the whole of the hot season. These conditions were expected to be favourable to the growth of the paddy crop in the following season and though according to the Cropping Scheme the whole of the bulk crop was to receive manure, it was withheld. As expected, the crop grew very luxuriantly in spite of no

manure having been applied and in spite of the planting having been somewhat later than usual owing to the late receipt of water in the canal. The lodging of the late varieties before or at the time of flowering also indicates that in such seasons it is advisable to plant early or medium varieties on all good lands, in preference to late varieties.

Besides the three main factors referred to already, there are other minor ones which have to be controlled, if the merits of the different varieties are to be correctly guaged.

One is the time of planting. Owing to the delay in water being received in the canals, the planting has sometimes to be deferred. But this affects some varieties—generally the early ones—more than the others. Care should therefore be taken to see that the planting is done at about the same time every year. After a certain date the yield drops more considerably in the case of most varieties and no comparsion is then possible. Another is the quality of the seedlings planted. It affects the yield considerably. Experiments conducted on the Samalkota Farm last year and this year indicate that good thinly grown seedlings give a larger yield than poor thin sown ones. Last year good seedlings of Konamani gave 10·6% and those of Navakotisannalu 20·6% more than poor seedlings of the same varieties. This year good seedlings of Palagummasari gave 15·5% more than poor seedlings. Experiments on the Paddy Breeding Station also confirm the above results.

To obtain seedlings of the same quality from the different varieties, it may be necessary not only to make the seedbeds for each variety uniform and of equal area, but also necessary to vary the quantity of seed sown according to their number per unit weight, say an ounce, for this varies considerably with different varieties and makes much difference in thickness of the stand if the same quantities are sown. Palagummasari for instance gives 1040 grains per ounce, while Navakotisannalu gives 1457 grains per ounce. There is another aspect, however of the question. Seedlings from small seed like G. E. B. strain 24 have a slender growth while those from big

seed like those of Palagummasari grow robustly and may naturally require more space. If the robustness of the seedlings always varies with the size of the seed, and this is very doubtful, it would probably be right to sow equal quantities of seed, in which case the space available corresponds to the natural robustness of the seedling. If, on close study it is found not to vary regularly with the size of the seed it will be necessary to sow the seed thin enough to allow of the free growth of the most robust of the varieties. In determining the quantity of seed to be sown, the percentage of germination should, of course, be also taken into consideration.

Another difficulty which has to be met, in conducting varietal experiments, is the effect of the shade of one variety over another, when they are grown in strips side by side. Some varieties like Turpu Sanna Akkullu grow tall from the beginning while others, like G. E. B. strain 24 and Ratnachudi, are dwarfish in the early stages and grow tall in the later stages. The extent of interference of one variety with another has not been determined in the case of paddy, but is likely to count for something in the case of some varieties at least. In sugarcane such interference has been marked. The difficulty may be met by arranging the varieties in their order of height, the shortest being on the sunny side, or strips of a dwarf variety may be grown between every two experimental plots. But this latter means more space and may not therefore be practicable in many cases.

To summarise, the questions that have to be answered in connection with varietal tests to enable us to proceed on safe lines, are:—

1. Does individual high yielding capacity mean collective productivity in all cases.

2. If so, what is the best spacing to give, in testing varieties for individual productive capacity.

3. If not, under what different spacings are we to try them to determine their collective productive capacity and how best are we to lay out the experiment so as to get a fair comparison?

4. Are we to manure plots under varietal experiments and if so whether lightly or heavily and with what manures?

5. Are we to vary the quantity of seed sown in the seedbed according to size of the seed? If not, at what rate are we to sow it?

6. Do the plots of one tall growing variety materially affect those of the other dwarf varieties by casting shade and if so what precautions are taken ?

Discussion on "Paddy Varietal Experiments."

Mr. F. R. Parnell, Government Economic Botanist, expressing his sympathy with the difficulties met with in conducting varietal experiments, mentioned in Mr. Jogi Raju's paper, said, that the trial of a simple agricultural experiment was not such a simple and easy affair, as it would appear at first sight. It was not unlikely that an experiment might take several years before definite results could be obtained. Various strains, he added, were being tried at the Samalkota Agricultural Station and it was only after getting definite results that the task of bringing large areas under the improved strains could be undertaken. Referring to the question of thickness of sowing, he stated, that remarkable results had been observed in the Paddy Breeding Station last year, on this point.

Gogu Cultivation in Vizagapatam District.

BY S. SITARAMA PATRUDU. L. Ag.

In this paper on "Gogu" cultivation in the Vizagapatam District, I will deal briefly with a survey of the crop in pre-war periods, its present commercial importance and the prospects of its *future* development.

Before proceeding to the subject proper, I invite the attention of the audience to one important fact. It is needless to point out that Gogu, or Bhimilipatam jute, finds its existence in our homes in

the shape of gunny bags, cords etc., and people may be tempted to question me as to why I took up a paper on an article giving us bags to hold the grain, while we are anxiously looked upon to increase the output of food stuffs themselves. I wish it to be clearly understood that I mean dealing with the importance of this cultivation only in those tracts where other crops are found failures and hence for want of a proper commercial crop, the lands remain waste.

Gogu or Bhimlipatam jute, as it is otherwise called is technically known as 'Hibiscus Cannabinus'. It is said to have been introduced from Africa and the earliest mention of it, is found in the Aini Akbari. Its use as a fibre plant is known to us from time immemorial. This plant is seen very commonly thinly sown in all sorts of crops, throughout the eastern Districts of our Presidency, but as a pure fibre crop sown extensively can be seen only in the north of Vizagapatam District.

This fibre received sufficient scientific recognition at the hands of members of the Agricultural conference held at Pusa in 1908, when it was declared to be second to none in the country excepting Bengal Jute. Special scientific investigations showed that Bhimilipatam Jute contained the same percentage of cellulose as Bengal Jute and could be put to practically the same uses. Also Bhimilipatam Jute was declared superior to the ordinary Bengal Jute in the smaller loss in mercerising and in the large increase in weight on nitration. (This I quote from Sir George Watt). Thus the reports conclude that Gogu is deserving of attention. The cultivation of this as a fibre crop on an extensive scale is very recent and its age from a commercial point of view may be put down as 20 years. For the first time in the Foreign market it appeared in London in 1903 when fibre worth 2 lakhs of rupees was exported from the ports of Cocanada, Bhimilipatam and Vizagapatam. It may be interesting to hear as to how this Gogu assumed commercial importance among the chief products of the tract. The ordinary spectator will be struck at the variety of crops grown in this tract not merely once but very often twice and even thrice in one and the same year both in wet and dry lands. On wet lands

the chief crop grown is paddy, which is transplanted in July, August or September and harvested in December or at the beginning of January. Then, irrigated gingelly will be sown in January and harvested in April. As an alternative or very often, in addition, a crop of Gogu or Ragi or red Gingelly is cultivated in June *usually without irrigation.* This is harvested in time to admit of transplantation of the succeeding paddy crop. On dry lands there are two cultivation seasons and two crops are usually raised, Ragi or red Gingelly being sown in May or June followed by Ragi or horsegram. Groundnut is also grown in considerable areas on dry lands. Indigo once grown on an extensive scale in the wet lands above specified is extinct now.

From the list of crops above mentioned it may be seen that, excepting paddy which is both a food and commercial crop, the other two commercial crops are gingelly and groundnut, 'Gingelly is notoriously untrustworthy' so says a Settlement Officer. It is apt to fail entirely if there be no timely rains. As for groundnut, complaints are being frequently made about the ravages of wild boars and about the difficulties in realising the crop whenever the North-East Monsoon fails. Gingelly, Groundnut, and Cogu occupy about 9, 2 and 6% respectively in the cultivated areas of this tract. The tract is purely rain fed with the exception of a portion, irrigated by the Nagavali in Palakonda and Parvatipur Taluqs under the recent project.

It may be well known that, from olden days, Palakonda continues to be one of the richest Taluks in the Vizagapatam District. This Taluq, the only Government Taluq in the north of this district was once leased out to late Messrs. Arbuthnot & Co. They arranged for indigo being raised in the Taluq to an enormous extent to as much as 5000 acres and thereby developed the indigo industry. But when synthetic indigo happened to be manufactured by the Germans, there was a terrible crash of the industry and hence of the indigo crop. This led to a sudden collapse of the company about 20 years ago, when Gogu was just raising itself into prominence. At this juncture, certain special factors contributed to the importance of this crop amongst others.

The untrustworthy nature of gingelly, the failure of indigo, the erection of a factory for preparing Jute at Chittivalasa near Bhimilipatam, the existence of innumerable tanks facilitating the retting and extracting of fibre, quite characteristic of this tract—the opening of a Branch Railway line from Vizianagaram to Parvatipur to facilitate transport, surety of the crop when once established, the absence of irrigation facilities, the risky nature of seasons, all added and contributed to the rapid spread of this crop.

The cultivation of the Gogu crop is also simple in nature and consists in broadcasting seed after proper tilth with or without manure. A hoeing or two are given when found necessary and when once the plants are established they require no more attention and grow to a height of 10 to 15 ft. and many a plant could be seen rising as high as the College hall.

To extract the utmost of the fibre the crop is not cut but the fields are, if possible, flooded and the stalks pulled out singly and splashed in the water to wash off mud. After lifting the crop it is either immediately retted or stacked and allowed to wait until the owner has leisure to attend to it. Retting takes about 15 to 20 days and the extraction of fibre is as follows:—

The stem is broken about 12 inches from the root, the fibre held in the left hand while the broken end of the stick is thrown away. This process is repeated until a fair handful of fibre is obtained when the upper portions are all *removed* together. The fibre is then passed to a cooly who gives it one or two swirls, in the water and twists it up. It is dried, bundled and kept ready for sale. The normal outturn may be taken as 800 lbs. of dry fibre per acre, the percentage of fibre to green stalks being about $3\frac{1}{2}$.

Marketing. Between the cultivator and shipper, many middle men intervene. Generally, the cultivator disposes of his stuff to a petty dealer who had received advances from a merchant or a broker. These merchants sell the stuff to a big buyer who may be an agent for an exporting firm or of a mill. The chief exporting

centres are Bhimilipatam, Vizagapatam and Cocanada with percentage shares of 58, 32 and 5 respectively. The principal pre-war destinations were, the United Kingdom (67%) France (8%) but in 1913-14 Germany took 5000 tons equivalent to nearly 25% of the whole. There are at present 4 mills one at Bhimilipatam, one at Vizianagaram now under construction, one at Ellore and the other at Guntur. The price on the whole can be put down as Rs. 40 per candy of 450 lbs.

In dealing with Indian Jute Industry an eminent authority says "It is not perhaps easy or possible to say any thing now concerning Jute Manufacture. An industry that exerts so great an influence on the fortunes of an important section of India's Agricultural Population, that gives employment to so many factory workers, that utilises large amounts of capital, that holds in its hand the industrial status and future of so important a city as Calcutta, has necessarily been much written upon. It has been again and again insisted that no country in the world is so favourably situated for manufacture of all forms of Jute goods as Bengal and no city so favourably situated as Calcutta. The fluctuations in the property of the mills, the varying prices but enormous aggregate values of jute crop, the great profits and abnormal dividends Jute mills here earned are known to every business man and investor in the country.

The first shipment of raw Jute was made apparently in 1795 but the recorded exports in 1828 were 364 cwts. only. In 1832—33 the figures rose to 11,800 cwts, and 1839 the flax and hemp spinners of Dundee began the manufacture of Jute fibre on power looms.

The handwork industry in Bengal, however, possessed such vitality that up to 1850 the exports of manufactured goods exceeded those of the raw material. The demand for the latter was largely increased by the cutting off at the end of the Crimean war of the United Kingdom from supplies of Russian Flax and exploitation of Jute as commercial fibre crop of the first importance dates from

that epoch. The first power mill in India to spin Jute started work at Riahra near Serampur in 1855 and the first weaving mill at Baranagore four years later.

Calcutta began to compete with Dundee. In 1896 Sir John Lang M. P. representing Dundee interests complained that "Calcutta has not only taken the whole of the Indian, Burmese, the Straits and Chinese, the Californian and Australian trade in Gunnies but is making large in-roads in North and South America, the Cape, Mauritius, Egypt, the Levant and the Continent. But not only so but large shipments are coming into the country (United Kingdom), while to the continent they were tenfold what they were in 1892. In the modern phrase, Calcutta Jute manufacturers have been on the 'boom' for several years. The manufacturers have made large profits with the inevitable result the large extensions of Machinery and the building of new mills is now in progress." This was 20 years ago and the industry is now going through a more prosperous process. During the war the industry received enormous profits and it is said the year 1918—19 was one of unparalleled prosperity for the Indian Jute Mills, in spite of a rise in the price of raw material.

Values, percentages and totals of raw and manufactured Jute exported in 1913—14 and 1918—19.

Articles.	1913—1914.		1918—1919.	
	Value.	Percentage.	Value.	Percentage.
	£		£	
Raw ...	20 55100	53·7	84,80000	19·5
Manufactures	18,849000	47·3	35,101000	80·5

Bhimilipatam Jute is given a very respectable place in the Statistical world. It satisfies all conditions which Jute does. When tried in our localities it gives better yields. It can be easily grown on fields which are away from water facilities and can be put to all

uses, but what is its position when compared with its sister industry? The following figures give the progress of the industry during the war.

				Tons.
1913—14	...	...	...	22006
15	...	...	...	6822
16	...	...	...	5857
17	...	...	...	6090
18	...	...	...	32
19	...	...	...	2376

There are only 3 mills and one just started. These mills do not consume even 1/10 of the crop that is produced and there were practically no exports There is no commercial organisation of any kind for this industry and the fate of the ryots can better be imagined than described. Want of proper commercial organisation, fraudulent ways of watering the stuff and thus deteriorating the value, proper demand, lack of enterprising spirit on the part of the capitalists, all contributed to give a set back to this industry. In spite of all the difficulties the ryot is persistently cultivating this crop and this all the more supports the view that the ryot cannot think of another crop and it is also admitted on all sides that it is very exhausting and the succeeding paddy crop generally gives very low returns.

What are the ways and means to bring this into prominence and secure reasonable profits for the producers? Who is to come to the rescue is the question? The solution is not far to seek. More than 9/10 of the biggest district in India are Zamindary lands. If the Zamindars should feel that the greater the encouragement they give to their tenants as per details given above, viz., proper commercial organisation, erection of factories in the vicinity etc., and render such help as capitalists do in England, they would not only be profiting themselves and encouraging their tenants but also be giving a great impetus to this important industry. But such help is generally conspicuous by its absence. To add to this, we have absentee land holders, merchants and the indifference of these is proverbial and the only hope is to effect a thorough investigation into the methods of cultivation and industry and selection of good types to suit the needs of the existing mills

and exporting firms and proper organisation on the lines of Cotton Improvement Work effected by the Department in the South and Ceded Districts. It may very well be borne in mind that no substitute synthetically prepared as in the case of Indigo is to be found in the world's market in the near future, all such attempts having failed in toto, that this crop is to be raised only in places where other and more remunerative crops could not be grown and that, once raised, this crop grows well, that the condition required is the existence of innumerable tanks for retting and extracting fibre and that such tanks are found in plenty in the Vizagapatam District. Hence it may be fairly concluded and this Industry would have a brilliant future if improved by the combined efforts of the three main Development Departments, Agricultural, Industrial and Co-operative mitigating the disabilities specified above.

Discussion on "Gogu cultivation in the Vizagapatam District.

Mr. Balakrishnamurthi, Dy. Director of II Circle, remarked that, in his opinion, it was not at all profitable to invest money in this crop, since it mainly served to give employment to poor families and the net profit on the sale of the fibre was but little. He further stated that experience of this crop in the Government Farms confirmed this view. He further doubted whether, as stated by the speaker, this crop could thrive when gingelly failed, since both were dry crops that would be equally affected by adverse seasons.

Mr. Patrudu replied that he agreed that the experience of the Samalkota Farm was not very encouraging, but submitted that conditions were quite different in the North of the District, where better methods ofextracting the fibre were known. He affirmed that the crop was really profitable in the tract he referred to.

Mr. Vellingiri Gounder, M. L. C., enquired of the speaker what sort of manufactured products were turned out of Gogu fibre, when Mr. Patrudu informed him that it was chiefly used for preparing gunnies and was besides put to various domestic uses.

Juniors and Research Work.

By Rao Saheb Y. Ramachandra Rao, M. A.

By proposing to plead the cause of Juniors in Research Work, let me not be misunderstood to imply that the present Juniors of the staff of this Research Institute are of inferior stuff or to insinuate that they are being unfairly prevented from taking part in research work. I do not mean anything of that sort. On the other hand, it is a real fact that a good many are actually employed in Research work, as also that some have shown no mean abilities therein. However, one has to admit that the general level of work of the average junior is not in all cases high. In some cases he exhibits an easy-going nature with a tendency to drift with the wind and the tide, or in others manifests a stunted growth due to improper nature or unfavourable surroundings. The general result of such a junior staff cannot but be a decrease in efficiency in the general work of the Institute, which will not only reflect discredit on the chiefs of the various sections but also on the general reputation of the Institute as a whole. The object of this paper will have been served, if it will result in giving an impetus to the juniors to undertake responsible work and in thus making them efficient members of the Institute.

It is a widely known fact that the Agricultural Department as a whole, including our Institute, formed the subject of much adverse criticism in the April Sessions of the Madras Legislative Council. Uncharitable views were freely expressed by several members regarding the general working of the department, stress being laid on particular sections thereof. It is unfortunate that, owing to the wide publicity the discussions in the Council got in the papers, the department stands accused before the general public with no chance to clear itself straightaway. The Institute is by no means intolerant of criticism. Criticism is really welcome, for it will let us know what our shortcomings are and where we have gone

wrong. "Oh! for that ability to see ourselves as others would see us!" as the poet exclaims. The Agricultural Department is one that has been created for the benefit of the ryots and it is its manifest duty to attend to the needs of the cultivating public. It therefore freely welcomes frank bonafide criticisms on its various activities and honestly tries to benefit from them. But if criticism is to be productive of good, it must be actuated by sympathy and made after deep scrutiny. Criticism must be constructive in character not destructive. It is no good to cast aspersions which cannot be substantiated and which will do more harm than good.

Let not the public, however, understand that our Institute considers itself above criticism. It has never yet claimed to have said the last word about agricultural improvements, nor arrogated to itself a state of perfection. Compared with various famous Research Institutions of Europe, it is but a child of yesterday, and has but just entered the threshold of usefulness. Considering its extreme youth, we claim that it has shown no mean achievement. In an applied science like Agriculture, only practical results tell. They are the only evidence of the usefulness of an Agricultural Research Institute and form the sole measure of its success or failure. Tangible progress, we claim, has been shown in various branches of Agricultural Science, as for instance, in breeding new varieties of paddy and sugarcane, in making soil surveys of definite areas, in improving methods of cultivation and devising remedial measures against plant diseases and insect pests: and we hope and trust that with the maturity of time, fuller results will follow.

In judging the outturn of work of a Research Institute dealing with Agricultural problems, one is apt to overlook the special difficulties of research in Agricultural Science as compared with the Pure Sciences. Agriculture is essentially an applied science wherein various branches of knowledge are pressed into service, as for example, Chemistry, Physics, Botany, Zoology, Veterinary

Science, Entomology, Mycology, Bacteriology, Engineering, Economics and Commerce. Owing to the large field it covers and the number of factors which affect it, Agricultural Research is beset with innumerable difficulties. As compared with Research Work in Pure Sciences—such as Pure Chemistry—Agricultural Research suffers from numerous handicaps. Whereas problems in Pure Physics or Chemistry can be attacked within the four walls of the laboratory, agricultural problems can only be solved in the field ; and whereas in the former case, conditions can usually be controlled at will, in the latter, conditions cannot be kept under check, since they are subject to such variable factors as the fickleness of the weather, the incidence of insect pests and plant diseases, and local variations of soil composition. In Physics and Chemistry and in many of the other Sciences, experiments may generally be repeated as often as one could wish, but in agricultural work one has to depend on the seasons and if an experiment is inconclusive, one has to wait till the following year for repeating it; and it may happen that owing to the numerous factors concerned, it may not be possible to repeat the experiment at all. A confirmation of results require the sum-total of experience of a series of years. Real Research in Agriculture is thus a waiting game: one has to wait sometimes for years for getting conclusive results. As an example of this phase of Agricultural experiments, the classic instance of the Rothamstead Experiment Station may be cited, where it took many years merely to perfect a simple standardisation of the plots preliminary to the experiments themselves. Veritably "*Truth is the daughter of Time.*"

While pleading for a recognition of the slowness of growth of knowledge in Science in general, and in Agricultural Science in particular, we ought to recognise that the public have a right to assure themselves that the machinery of Research, maintained at state cost and financed from the contributions of the ryot, and explicitly designed for his benefit is in good working condition, and

further to insist on its maintaining a state of efficiency. The very fact that there were lively discussions in the Legislative Council on the working of the Agricultural Department shows the interest the elected representatives of the public are taking in us, and such interest is specially to be welcomed, as it evidences the newly-born democratic spirit of a "government of the people, for the people and by the people."

That the cultivating public is showing greater and greater evidences of its recognition of the useful functions of the Agricultural Department—and of this Institute in particular—is becoming manifest by the increasing number of enquiries received from them. These enquiries are of a very varied character. Some of them solicit information regarding remedies for insect pests and plant diseases, others seek advice on manurial problems, and while yet others voice a demand for improved varieties of seeds. Whereas certain of the queries refer to problems keenly felt throughout the land, others regard special conditions of certain restricted areas. A certain percentage of the enquiries are of a character that may be satisfactorily answered forthwith, whereas others are of so complicated a nature that a special investigation, which may perhaps take several years, is needed before a solution can be suggested. There is, on the whole, a distracting variety in the enquiries received : and if it is expected that a Research Institute should consider it its duty to satisfy very one of them, it is necessary to see that the mechanism of research should be made comprehensive enough to deal with the work without much strain. When, for example, one recognises that even in such a simple case as a routine analysis of a soil sample or manure, the work taxes the attention of a worker for several days in succession, or that in the case of insect pests reported, the study of the life history may take a month or more even in ordinary cases, (and sometimes several years where a complete study is necessary). One will understand how greatly the energies of the Institute may be taxed.

In certain cases problems could not be taken up for investigation for want of sufficient staff, and in other cases, insufficiency of hands has led to insfficiency of work. When one considers what a large area of territory a single Institute like ours is expected to serve, and compares it with the innumerable institutions with which a much smaller country like England is equipped, one will understand the in sistent demand for an expansion of staff and admit its real expediency.

But as is well known, the present moment, owing to the existence of a financial crisis, is not the time for indulging in hopes of an accession of strength to the staff. Perhaps the present crisis may pass away soon, but it is more probable that it will last for some years to come, till the equilibrium upset by the Great World War is once more restored. Until more propitious times dawn on us, it is to be feared the Institute will have to get on as best it can with the available staff. As, notwithstanding the financial stringency, enquiries continue to pour in and work continues to increase, the only course left to the Institute is to adapt itself to the altered circumstances. In my humble opinion, the adaptation needed under the present conditions should be two-fold; viz., (1) Concentration of energy on particular problems and (2) increasing the efficiency of the present staff.

Firstly, so long as sufficient hands are not available, it will not be possible to attend to enquiries of all sorts. Dissipation of energies on non-essential questions will not be productive of any good, while if all the available energies be economised and directed to the solution of the more pressing problems, useful work will have been done.

What is wanted at the present time, is more and more of intensive work, vigorously seeking a permanent solution of problems on hand, rather than diffuse work of a superficial nature not leading to any particular issues. Only questions of immediate importance—main problems needing urgent attention—should be

taken up, and all the available staff should be concentrated on them, care being taken to keep hammering at the questions till a definite solution is reached.

Secondly, the mechanism of research as it exists at present, is in my opinion capable of great improvement. If readjusted and remodelled, it is capable of being brought to a higher state of efficiency, enabling it to produce an output not only larger in quantity but higher in quality.

Research work in the various branches of Science is now attended to by a staff of Assistants and Sub-Assistants of various grades, under the direction of Experts. As a general rule, the individual members of the staff are given such work as happens to come to hand at the time and when in due course that piece of work is finished, attention is turned to some other work that happens to turn up then. The result of such continual shifting is that the particular individual is not enabled to specialise in any particular line of work and thus acquire the efficiency that is born of continued experience. Though such a specialisation need not be strictly enforced under *all* conditions, yet it would be beneficial not only to the worker but also to the Institute, if encouraged wherever possible.

Again, implicit obedience to instructions is, of course indispensable in many matters, yet if a more satisfactory type of work is desired, it would be a better plan to induce the individual to take a living interest in the work on hand by making him absolutely responsible for results and thus compelling him to show his own individuality in the matter. By this method not only does the worker escape the pit-fall of following the letter of the order without understanding the spirit of it, but is compelled to use therein all his resources as well his powers of observation and deduction, thereby ensuring a more efficient performance of the work undertaken. This plan will not only have the effect of improving the junior but enabling him to develop a power of

initiative and take up independently problems of a minor importance, which he may be expected to work out of his own accord during his leisure hours, guided of course by the willing help of the expert where necessary.

The following extracts from the suggestions for Research given to the Lac Comittee by the late Mr. Howlett may be useful in this connection. "Many people forget, or do not know that what is officially known in this country as "Research" should really be considered as two practically distinct types of enquiry. One type of "researcher" must be born, while the other may be made. The first is the man with the original mind seeking new discoveries; he looks for unknown relations between things, invents ways of explaining known relations in some new way, or devises some fresh method of technique which shall reveal unexpected facts and relations. Originality of thought, method, or outlook is the characteristic of his work. Work of the second type, on the other hand, does not require and is not charcterised by originality, though it may demand technical skill and accuracy of observation. It consists mainly in description, on the collection of data, and the application of familiar laws and methods to particular cases. Of these two types, the first may be the more valuable but the second is the more common, and is the only one amenable to direction and control....."

Of these two types, the first type of "researcher" is as Mr. Howlett says, born, not made. If one of this class exists among the Juniors, he can never be suppressed nor does he need any coaxing to come out of his shell; for he cannot hide his light under a bushel for ever. But the ordinary run of Juniors can anyday become 'researchers" of the second type. The only requisites needed are a spirit of sincerity, enthusiasm and devotion to Truth. Though the "researcher" of the first type is of supreme value, the second type is not without his use. He collects the

facts and gathers the material on the basis of which the original thinker erects his far-reaching generalisations. In this connection, Mr. W. A. Locy observes in his "Biology and its makers"—"In the progress of Science, there is an army of observers and experimenters each contributing his share, but the rank and file supply mainly isolated facts, while the ideas take birth in the minds of a few gifted leaders., either endowed with unusual insight, or so favoured by circumstances that they reach general conclusions of importance. These advance guards of intellectual conquest, we designate as founders.....A study of the lives of the founders shows that that the scientific mood is pre-eminently one of sincerity. The men who have added to the growth of Science were animated by an unselfish devotion to truth, and their lasting influence has been in large measure a reflection of their individual characters. Only those have produced permanent results who have interrogated Nature in the spirit of devotion to truth and waited patiently for her replies. The work founded on selfish motives and vanity has sooner or later fallen by the wayside. .....Some of the glories of the human race are exhibited in the lives of the pioneers of scientific progress in their struggles to establish some great truth and to maintain intellectual integrity."

The uphill paths of science are arduous, tortuous and tedious; thorns and thistles bristle in every direction, and one is easily tempted to throw the burden down, halt by the way side, and dream and languish like Tennyson's Lotos-eaters. This happens only because the driving power of enthusiasm is lacking. Enthusiasm is a species of intoxication under the influence of which the worker feels neither despondency nor weariness. When possessed by that madness, he is aflame with the yearning to grapple with obstacles and to work on, and on until the goal is reached. Without the help of this Godgiven force, most of the discoveries of Science could never have been accomplished and none of the wonders of this wonderful century could have found the light of day. The full

force of this power is never so well demonstrated, as in the lives of the founders of modern science, wherein we recognise how deep their enthusiasm should have been, to enable them to toil for the discovery of truth, in spite of well-nigh impossible conditions. The example of these great founders of science should have the effect of firing us with enthusiasm and inciting us to do what we can in our humble way, towards the advancement of knowledge.

A great factor in the stimulation of Research is what may be termed an atmosphere of Science. It is this atmosphere of Scientific research that is characteristic of the famous centres of learning in England and Europe and that is responsible for all the great scientific activities of those institutions. It ensures that all the young workers that come within its charmed circle, catch that noble infection and become inspired to work in the cause of science. The great advantage of these old Universities of England over our institutions in India, would appear to lie, not so much in the spaciousness of the laboratories, nor even in the richness of the equipment, but in the possession of an atmosphere instinct with the spirit of Research. The votary of knowledge that seeks these Universities feels with a sense of awe that within the very same walls had lived and worked famous scientists, who had created land-marks in the various branches of science; he further feels that though dead long ago, these great men continue to live not only in the portraits that adorn their halls, but also in the glorious traditions that they had bequeathed to their successors. Added to mere traditions, these institutions further possess a galaxy of earnest workers devoted to the cause of science, and is it a wonder, under such influences even the dullest novice finds an inspiration for work?

Can we not create such an atmosphere in our Institute? Can we not borrow a modicum—however little—of that Promethean Fire from over the seas and establish it here to serve as an inspiration for our workers and students here? I for one, would most

emphatically reply that we can; but only if we are prepared to gird up our loins and work for it selflessly, and with a will. In a young institution like ours, we naturally lack the traditions: for our traditions are yet only in the making. Not only have we to build up our traditions but we have also to bring into being a spirit of camaraderie of scientific Research. Every worker should set about to work with determination; each in his own subject, in a spirit of devotion to truth and with the help and guidance of our chiefs—many of whom have drunk deep at the fountain of knowledge in the old English Universities, conditions would be ripe for the establishment of traditions aud ultimately that of the needed atmosphere of Research. Just as a single tree however huge or old it might be, cannot make a forest, in a similar way a solitary investigator or two, however eminent they may be, cannot bring into being, the scientific atmosphere. It is necessary that he should collect round him scores of enthusiastic followers, all engaged in interrogating Nature and solving her problems; and when numbers of investigators,—no matter what their status may be or their age—but all permeated with a spirit of earnest enquiry, are found grouped together in any Institute, the essential conditions for the creation of the scientific atmosphere are fulfilled.

In this connection it is needless to point out that the ways of a Scientific Institute are quite different from those of a Public Department of Government. In the Military or the Police or even in the Revenue Departments in India, the consideration that rules the relation between the superior officer and the subordinate is chiefly a question of discipline. One gives an order and the other is bound to obey it implicitly—unaffected by considerations of right or wrong. The realm of Science, on the contrary, is a democracy, where the relations of the Senior workers to the Junior are animated more by the feelings of brotherhood and sympathy and are rather those of an elder to a younger brother than that of master and servant. The workers are swayed by the feeling that

all are working in the selfsame cause of science and are engaged in the selfless search for truth. The true scientist is actuated by the same spirit as inspires the sportsman in the world of sports and whatever be the individual status of the workers in life or in society,—sportsmanlike—the scientist considers all are equal so long as tney are engaged in the same pursuit of knowledge.

There are a few snares into which we—the Juniors—sometimes are prone to fall and which we should be careful to avoid. We have generally a tendency to weigh out work according to the amount of Rs. As. and Ps it procures us or is likely to secure for us in the future. I confess to have sometimes asked myself "Is not the work turned out sufficient for the pay I get?" No doubt the argument is faulty and the sentiment not praise-worthy, but the pinch of the stomach is absolutely the most insufferable damper of enthusiasm and of even a conscientious view of duty. It is the middle class, to which most of the Juniors belong that is the hardest hit in any economic crisis, and yet it has to maintain a rigid irreducible minimum of social decencies and is expected by society to make a show which it cannot really afford to bear. The unseen canker of care and anxiety serve to destroy all the enthusiasm of an ill-paid worker. It is therefore incumbent on the State to see, that in the interests of science, if not of the worker, the staff is assured a decent competence. In spite, however, of the force of this fact, an attitude of a scientific worker, whereby he brings the level of scientific work so low as to measure it with a mercenary eye, is absolutely to be condemned. Whatever the conditions be, work should be done, not by considerations of money but for its own sake: and the right view must be work for work's sake: and the right outlook a feeling of pride and thankfulness that he has been given the *privilege* of working for science and ultimately for the good of his country.

Again deluded by false logic, we are often tempted to measure the importance of a work allotted to us, by the prospective

results or reward that are likely to follow. It often happens that good or even indifferent work is followed by a magnificent reward—in the shape either of fortune or of fame: but if one, on this account, works in the sole expectation of such a reward, he is really gambling on a chance. It has often happened that rare type of work has remained unnoticed, until, in the course of the general advancement of knowledge, long after the death of the poor honest soul, the real greatness of his work has burst on a repentent wondering world. I refer to Mendel. When a piece of work is viewed with an ulterior motive—and not in a spirit of pursuit of knowledge—it becomes contaminated and is almost immoral. In the words of Lord Krishna in the Gita, the motto of the scientific worker should be "Thy outlook should be simply thy duty and never the consequences thereof." The Juniors should set before themselves this high and lofty ideal of work and discard a vulgar outlook of the probable or possible consequences thereof.

If the Juniors should remember one point more than any other, it is that their greatest asset is their youth. Youth is the age of vigour, enthusiasm and all noble impulses. It is the time when the mind is fresh and elastic, pure and uncontaminated. The blood courses at breakneck speed in the veins and if these wild impulses are curbed and directed in the channels of scientific enquiry, achievements of great import will be the result. If, on the other hand, the age of youth is allowed to run riot without being utilised, the great chance of a lifetime would have been lost. With the passing of years, cold, selfish calculation takes the place of the generous impulses of enthusiasm. The ingenuous, frank ways of youth are lost and motives of policy and tact take their place. Instead of the golden impulses of generosity and self-sacrifice, the mind is filled with the dross of selfish and sordid motives. The man may be a success in life so far as the ways of the world are concerned, but he is a nonentity in the realm of Research.

It is therefore the duty of the Juniors to make hay while the sun of their youth shines. If, realising their potentialities, they set

about to work in earnest, they would not only shed glory on themselves, but bring credit to the chiefs under whom they may be working and add to the reputation of the Institute and the glory of the Motherland.

Further, the juniors should realise that in questions which are mooted in popular assemblies or Legislative councils, it is not the chiefs of Sections alone that are responsible, but ultimately also member of the staff however low in the rungs. It is only when we recognise our ultimate responsibility, not only to the Councils but to the country in general, that we will realise how important the work of each individual member of the staff really is. If the senior officers are responsible for their work to the Councils and to the Government, each individual of the staff is similarly answerable to the questions of the ryots he meets with in the course of his duties.

Sometimes the plea of want of encouragement of work from the chiefs is urged, but it does not really matter, even if it be true. Real improvement must always come from within, not from without. External influences such as encouragement and advice will certainly be of great help, but if improvement is to be permanent, such temporary props cannot set us on our legs. If we develop a real thirst for knowledge and realise our responsibilities not only to the Institute and the country at large, but *to our own selves*, the encouragement from our chiefs will surely follow as day follows night. The main point is to realise that it is never productive of good to shove the responsibility on "the other man." With this sense of responsibility and with a real enthusiasm for work. our Juniors, let us hope, will under the fostering care of our chiefs, develop into very efficient members of the Institute.

The spirit of Research may be likened to a flame and the Research Institute to a Parsi Fire Temple. Just as it is the sacred duty of Zoroastiran Priess, to maintain the sacred fire,—to keep it, to tend it and to see that it is never extinguished, equally sacred similarly are the duties of the Specialists—our

chiefs of the various branches of Science—to keep the torch of knowledge alight, feeding it with the incense of enthusiasm, and to see that it burns brighter and brighter till the darkness of ignorance is utterly dispelled,—till everything shines with the effulgence of truth.

May God help us in the attainment of this sublime Ideal!

Why the public is not impressed with the work of the Agricultural Department.

By K. T. Alwa, L. Ag.

Nowadays it is not unusual to hear from Council Chambers, platforms and the Press that the Agricultural Department has not impressed the Public, the money spent on it is a waste of public money and the only remedy is to abolish that Department. Before we go deeper into the question, we are to consider who represent the public and whence they get their impressions. The present representatives of the public are mostly lawyers and they get their impressions from urban surroundings. Agriculture is a rural subject and the Agricultural Department has to make an impression on rural population The general temperament of an urban population is enthusiastic and progressive, whereas that of a rural one is dull and retrogressive. The condition of towns and cities is improving day by day and the people feel that they are advancing in civilisation, material prosperity, education and other things. They feel the present is better than the past and the future is still more hopeful. Whereas the condition of villages is retrogressive. The man with the slightest progressive ideas and enlightenment deserts the village, thinking that it is a fit place for never-do-wells to live in. The majority of the village people think that the past was good, the present is bad and the future will be worse. The highly developed intellect of a lawyer cannot

grasp the difficulty of creating an impression on the the minds of the illiterate ryots. The lawyer always deals with the trained minds of judges who get impressed with the arguments of the lawyers very soon. A trained mind is operating upon another trained mind having similar lines of thought and aspirations. In the case of an agricultural officer operating on the mind of an illiterate ryot, the case is quite different. There is a wide gulf between the two minds. The ryot thinks that his forefathers were happy without new methods being adopted and the advice of an outsider who comes to his doors unasked would make his miserable lot still worse. To get over these prejudices of the ryot and to develop him to receive our impression takes a good deal of time.

There are two ways of making a man advance, one by pulling and the other by pushing. A powerful orator of Cape Comorin runs up to Madras, holds a beach meeting and appeals to the audience to destroy the foreign goods. Some among the crowd throw their caps and a bonfire is made. The enthusiastic orator thinks that he has impressed his audience and the bonfire is the result of his efforts. The general tendency of the urban population is to jump for advancement and the worker is only to touch them from behind by way of pushing. They jump forward without knowing where they jump. With rural population, especially with ryots, the case is quite different. They are as cold as ice and as firm as a rock and to kindle a bonfire is very difficult with them.

To push a ryot forward in the advancement of agriculture is not a sound policy and might lead to failure. The agricultural officer is to pull him towards improvement. The act of pulling is more difficult and takes a longer time than that of pushing. One cannot run up to a ryot who is firm in his village, and attempt to pull him. The ryot is is in an advantageous position regarding the knowledge of local conditions and hasty attempts may lead to undesirable results. Before one attempts to pull a ryot, he must

press his heels well, look the ryot eye to eye and then stretch his helping hand,—and that is, the agricultural officer has to study the local conditions of soil and season, has to make enquiries of local practices, has to observe the ryot in and out of season and then only suggest improvements. When the ryot stretches his hand, he should be gently pulled and taken as a comrade along the path of progress. All this means time and the impatient public might think that we are not creating an impression. To push a ryot forward who is unprepared to receive your shock is dangerous and the first duty of a rural worker is to prepare the ryot to receive his instructions.

Very often the Agricultural officer has to answer the ryot for the work of other departments. He will have grievances against certain Departments and he takes privilege with the Agricultural Department to discuss the policies of various other departments before he makes up his mind to take up our suggestions. The Agricultural Department is a smooth spot in the Government Machinery and the ryots freely handle it with due respect to other thorny spots.

Once I suggested to a ryot to grow green manure crops and the ryot suddenly got irritated and asked me whether I belonged to that Department which deprived the ryot of his mother. I asked him what he meant by that. He told me that one department deprived him of the benefits of forests, and green leaf is mother's milk to a cultivator. I immediately told him that I did not belong to that Department but to another Department which helps starving ryots. "It might be you were deprived of your mother's milk and you were starving, but the only way of saving you was to give you some other milk in the shape of green manure crops." On another occasion, one ryot asked me whether I was not a Hindu. I replied him yes. Then he raised his eyes and hands to heaven and asked me, was not the curse of his starving cattle on our heads? I asked him why. He told me

that we had deprived his cattle of their grazing ground. Such instances will be numerous and every agricultural officer is familiar with them. This Department has to work in the midst of uncompromising elements, on one side, the poverty and the ignorance of the ryot and on the other side the rules and regulations of several departments. We are to pity the one and to respect the other and to carry on our mission with the ryot by explaining to him the policies of various other Departments. I think the Agricultural Department has explained to the ryot the policies of the Forest and the Revenue Departments more than those Departments ever cared to do. Our task with the ryot is not merely agricultural, but a good deal of preparatory work has to be done in dispelling the ignorance and the prejudices of the ryot before he takes up agricultural improvements. All this means time and slow progress.

Another important cause for the slow progress is the vastness of the work and the insufficiency of men in the field. The whole Department is manned by about 32 men in the superior service and a little over two hundred men in the subordinate service. Men in superior service are engaged in teaching, research and supervision of the work of the subordinate staff. Out of 200 men in the subordinate service, 72 are engaged in research and teaching 65 manage 22 experimental stations and 63 are available to carry improvements to the doors of the ryot of 40,000 villages of this Presidency. Imagine, gentlemen, what impression we can produce with this small number of men taking into consideration the vast field of work. The present strength is after the reorganisation and the expansion of the Department. A dozen years back even one-fifth of this number was not available for work. When a small number of workers is asked to cover a large area, the work must necessarily be superficial. The few men that were in the field might have, in the hurry

approached wrong persons who promised them to carry improvements. In earlier days we approached lawyers, big absentee landlords, District and Taluk Board Members and members of the District Agricultural Associations. These gentlemen were kind enough to purchase our seeds, manures and ploughs and gave us some encouragement in the beginning. We gave them hopes of cent per cent additional profit by adopting our methods and they gave us hopes of cent per cent of carrying out our suggestions. Well, gentlemen, both sides were disappointed. We found in many cases our seeds, manures and implements never saw the the fields; they were bundled up and kept in a safe place and were shown to us when we visited these gentlemen next year saying that the things were safe and their tenants were so bad that they never took up their suggestions. The few that tried found that the profit was small, only 5 to 10%, which was not worth their consideration and gave up the trials thinking that the practice of law paid better than performances in Agriculture. They admit that to persuade their own tenants and relatives to adopt new methods is difficult, but they raise their hands to give a deathblow to our Department saying that we have not impressed the public, forgetting that our struggle is one of persuasion, and not of power, in the midst of poverty, ignorance unfavourable seasons, famines, pests and pestilences. When we get more men to work, we concentrate our work, get better knowledge of our surroundings, go the ryots in villages who need our help and not to men in towns who call us for a show. We are not satisfied with the quantity of seed distributed or sold, but we look into the area sown with these seeds. We are not satisfied merely with the area sown and the green manure crops grazed by cattle, but we see that these crops are ploughed in and used as manure. When these are used as manure, we see that ryots get better results and are satisfied with our suggestions. If not, we further investigate the question. We realise our satisfaction consists in the satisfaction of the ryot.

We thought that ryots would visit Experimental and Demonstrative farms maintained by the department and get benefitted by the results. But we hear from our critics that in Government farms, sovereigns are sown and rupees are reaped and the Department can afford to grow good crops, because the Government Treasury is at its back and improvements will not stand the test when they are tried in the ryots' lands. We have taken this criticism in a cheerful and constructive spirit and our Demonstrators have begun to start private demonstration plots in ryots, lands. Fairly well-to-do land-owning and cultivating farmers are approached and they are requested to place one or two acres at the disposal of the demonstrators. These plots are worked jointly, the ryots supply labour and capital and the demonstrators give advice and supervision. In these plots simple improvements on paddy cultivation such as green manuring, thin nursery, trial of better varieties of paddy, economic transplanting, selection and application of well-preserved cattle manure are tried. In the current year eight such demonstration plots were started in the North Arcot District and the results are encouraging.

Here I may say a word about improvements. The improvements we suggest do not aim at making a millionaire a multi-millionaire. They are simple improvements intended for poor working farmers. They aim at economy, better yield, prevention of waste and supplying the wants of the ryot at a cheaper cost. These improvements may not be the inventions of the Department, but the Department takes the credit for popularising these good practices among ryots who do not know them. These improvements might not add cent per cent additional profit, might not pay as much as law, or commercial speculations, but surely bring in a substantial saving and an additional profit. Our suggestions are simple but of great importance. As an example, the actual working farmer is too poor to invest money on manure, but the little manure he gets from his cattle is not properly

collected and returned to the field. Every one would admit, that a good portion of the cattle urine is wasted and the dung is not properly preserved. The Agricultural Department has been preaching to the ryot to minimise this waste by adopting better methods of collection and preservation. The response is feeble and we are not satisfied with preaching alone. Now we take our head coolies to the doors of the ryots, dig pits, construct sheds, collect manure in these pits, carry it to the field, apply it to the crops and show better results to the ryots. All this means time and slow progress. The ever anxious public might ask us whether our experts and Demonsorators are paid for doing such a simple work as the collection of manure. Our lot is such as to do simple things in this world. Our Experts find out the manurial value of this waste and suggest methods of preventing it and our Demonstrators demonstrate it at the doors of the ryots. We realise the importance of this national waste, and try our best to minimise it.

The Public might think that the result of work entirely depends upon our exertions. This is not so. There are several factors which are beyond our control, the most important being the season. Unfavourable seasons might not give the full benefits of our suggestions and ryots get disheartened, or we might not be able to start an improvement at the proper time for want of seasonal rains. Our works are guided by seasons and not by hours and minutes, losing a season means losing the whole year. If an improvement is started under unfavourable conditions, it cannot be immediately wiped out and started again. This means slow progress.

The educated portion of the public who condemn us have no faith and patience in Agricultural improvements. They hate rural life and all rural questions have been neglected. Sanitary commissions have sat, Educational Commissions have discussed,

Public Commissions have decided and many Commissions have come and gone, but the rural conditions remain the same. Social, Religious, Educational and Political Reformers have begun their work long before us, but the results of their work have not penetrated the rural areas. The condition of the villages and the man who actully handles the plough is the same as it was a century back. There is a steady migration of better brains from country side to towns. Every reformer wants better brains to deal with, but the public expect us to achieve immediate success with the most neglected portion of the population. It is our experience that with a man having slightly developed brain, who actually remains in his village and cultivates his land we are making quicker progrees. It is a pity in many cases the actual farming is passing into the hands of penniless and brainless people.

When an improvement is worked out successfully in the field of a ryot, the next step of carrying it to the door of his neighbour and spreading it in the village has also to be done entirely by the Department. We do not find any village organisation or educated man to assist us in this work. No doubt we look to rural co-operative societies for this help, but at present they are engaged in organising themselves and putting their finance on a sounder basis. They are assisting us, but we hope they would see a greater portion of their finance is spent for productive purposes, such as agricultural improvements. We see here and there a few retired officials returning to their villages and putting their hands in to agriculture. With such people we get into popularity very soon, and although we cannot expect much active propaganda work from them, they are of great help to us. If greater numbers of educated men return to their villages and take up questions of rural advancement, the Agricultural Department will make greater and faster impression on the public mind. It is the repulsion of the educated public for rural life and rural questions that makes it difficult for us to create an impression and not the hollowness of the Department.

We sometimes hear that a fresh student from an Agricultural College is no better than a Mali, so the College should be abolished. Well, gentlemen, in life do we not find a fresh law graduate is sometimes no better than a law tout or a life-long litigant, or a fresh medico is no better than an experienced compounder, or a fresh graduate in Engineering is no better than a road Maistry? But do anybody dare suggest the abolition of these colleges? And if one is bold enough to do so, he will be considered by our public men as a fit object for a lunatic asylum. Then where does the difference lie? The only difference is that these colleges are University Colleges and Agricultural Colleges are "Mammaty colleges" and University men are our Public men. To attract public attention, there must be a certain amount of show. Knowledge and good work alone will not catch public attention. A certain amount of show and self-advertisement is required to create an impression on the public. If Agricultural College students become University men, a certain amount of dignity will be added to their knowledge and they will become one among the public. They will have a voice in sending their representative to the Legislative Council, who will think twice before he talks anything against their work and protect them from the destructive criticisms of others.

Public spirited men put their hands into various honorary works, but not to agriculture. Title is showered on them and it is a sufficient incentive in many cases. We are to learn a lesson from our sister department, the Co-operative Department, which has a host of honorary workers in the name of honorary Assistant Registrars. Co-operative District and Provincial Conferences are often held, resolutions are passed and the public are brought into touch with the work of the department. I think that department is more popular with the public than the Agricultural Department. I do not know why we should not have recognised honorary Agricultural organisers from the actual cultivators who help the department in carrying out improvements. Dr. Slater once said that knighthoods should be conferred upon men who help the Government in the advancement of agriculture. There is much truth in this saying and if

not knighthood at least we may start with Rao Sahibs and Dewan Bahadurs on people taking interest in agriculture.

Well, gentlemen, I am afraid I have overstepped the time limit. The object of this paper is not to retaliate the criticisms of the public, but to place before them our difficulties in making quicker progress. We receive all constructive criticisms in good light, but destructive criticisms might dishearten our young workers, prejudice the mind of our sympathisers and make our work still more difficult. Our policy is to work with one who wants to test our merits and not to argue with him. We are not magicians to revolutionize agriculture in a day, but we are humble workers toiling to add annas and pies to the purse of the ryot from year's end to year's end. What seems to be a public waste to urban population is not a public waste to rural population. The ryot in a village thinks that money spent on University education and medicine is a public waste to a rural population. But, gentlemen, are we to consider these questions from such a narrow standpoint of view? I leave it to you for an answer. The students of this college might not possess provincial tongue or Imperial eye,, but they will not be wanting in rural eye and rural tongue. We leave Provincial and Imperial questions to University men, but we are qualified to take our part in rural advancement, our country's greatest need. When this college produces more men, they will have to handle rural education, rural credit and such other branches of rural advancement in addition to agriculture.

A word more to our young workers and then I have done. You are placed in the midst of two rocks, on one side, the slow yielding ryot and on the other side, the quick judging public. To the one give your heart and to the other show your back. The ryot needs your heart more than your back. Your work is a tedious one. You are to go to the door of the ryots as if for begging. When you go to a ryot you will not find him, even if you find him, he will not come out of his house, even if he comes out he will not talk to you, even if he talks he will talk evasively. Then you will get disappointed, but do not lose your head or heart. After your repeatedly going to him

a time will come when he will pity you. That is the time for you to catch him. You have moved his heart and now you give him your heart and lead him very cautiously. The life of a real demonstrator roaming about villages is not a pleasant one. It is full of hardships and disappointments. In your odd moments, I request you to think that you are undergoing all those difficulties for discharging your debt to the ryot who has contributed to give you sound education in this Institution.

Discussions on "Juniors and Research work" and "Why the Department has not impressed the Public so far?"

Mr. C. V. Vencataramana Aiyangar B. A. B. L, M. L. C. stated that he was the owner of a large extent of land in the Coimbatore District, and that therefore he was, though not an actual tiller of the soil, much interested in Agriculture. As a proof of his interest he had sent his son to the college to take up agriculture as a profession. He remarked that he had heard many of the speakers use hard words against the Legislative Council and added that if they had thought that the council had misunderstood the Agricultural Department, the truth was that they had misunderstood the council. He deplored that the speeches of members of the Council were not published and were thus liable to be badly mangled by Press Reports. He declared that, as the Agricultural Department formed one of the transferred subjects, the council as a whole sympathised with it, as contrscted with the reserved subjects, and promised that they would try to vote as large a sum as possible in the next budget. He however considered that the Department ought to be popularised to a greater extent, and that in his opinion, the best method of popularising it was to Indianise its personnel to a greater degree. He declared that he did not agree with Mr. Alwa when he said that the Department had not impressed the public so far, but asserted that it had really made an impression on the public mind. He only deplored that the Department had not made such a mark as one might have expected it to. He exhorted the demonstrators to go to the ryots in a missionary spirit and with patience and perseverence to bring home

to them the usefulness of the Department. As instances of cases where the people were dissatisfied with the work of the Department he cited the application of the Pest Act against the Cotton Bollworm, and the ravages of the Betel-vine worm. In the first case, he suggested that remedies other than the present destructive methods might be found out and in the second, he wished further investigation might be made to check it, adding that he was personally a sufferer by the existence of this pest.

[The speaker is referred to an article under the heading "Pink Bollworm and the Pest Act" in the November Issue of this Journal, with regard to his enquiry about remedies for the Pink Bollworm. *Editor.*]

Mr. V. C. Vellingiri Gownder M. L. C. declared that it was true, that criticisms were made, and are being made, in the Legislative Council regarding, the Agricultural Department, but that they need not be taken to be a discouragement of, or a reflection on, the work of the Department. It was true that in certain instances he did not approve of its wisdom, but that need not be taken to mean to be a condemnation of the whole Department. He further said that the ryot did not understand, nor care, what "Research" was, but what he *did* care for was something that would immediately benefit him, and desired that the Department would endeavour to be of use to him.

Rao Sahib M. R. Ramaswami Sivan, Government Lecturing Chemist, said that, while he accepted the idea that there should be a spirit of brotherhood between the Seniors and the Juniors, he considered that the scientific sections should be relieved of certain non-scientific routine that took up a large part of their time. He therefore welcomed the proposal of creating a central office at the institute to look after such work, so that the experts may be enabled to devote more time to real research work. He then appealed to the members of the Legislative Council of the Coimbatore District—whom, he funnily remarked, many of the officers of the institute had taken personal trouble to vote for—to form themselves into an informal committee and to visit the Institute as frequently as possible, not only

to find out what was being done, but to give suggestions as to what might be done, and instanced the visits paid by our Development Minister, the Hon. Mr. K. V. Reddy Naidu and by the Hon. Mr. Sarma of the Government of India. He next explained the difficulties of Research and stated that experiments often ended in failures and that from such failures, knowledge grew. He declared that the Department did not ask the ryot to undertake experiments, but, on the other hand, tested methods in all possible ways to satisfy itself before it recommended them to the ryot's adoption.

The President, in closing the discussion, suggested to the council members to fix upon a day and move a discussion in the council about the activities of the Department, and pass a resolution thereon.

Why we should study Agriculture.

BY J. HUIDEKOPER.

In bringing before you the subject of my paper to-day, I wish to speak to you as to young men who are on the eve of entering on active service for your Motherland. Now, or at most within a year or two, your course of preparation for your life's work will be over and you will become members of the active generation,—the generation on whom the future of your country will largely depend during the next thirty years or so, if not for centuries.

This time in your lives is one which recurs in every generation,—your fathers had to decide on the line of activity, on the motives, which should guide them throughout their lives,—and your sons will later do the same. The problem is ever recurring, but there are times when a nation is, as it were, at cross roads, and when its active generation has to make a decision, the results of which may last for centuries.

There is no need to tell you that such is the position of India to-day, but there may be the need to tell you that such is the position of probably every nation in the world to-day, and that no nation will

choose the right cross road at this critical period of the world's history if it chooses its line of action regardless of the other sister nations, which share with it the life of this globe. The time has come when nationalism must not be narrow, when nationalism must be to internationalism what citizenship of a town is to citizenship of a country. Each nation must be willing to give something to other nations, all nations must be as members of a family,—the family of humanity.

It is therefore necessary to cultivate broad views, to study the history, both political and economic, of other countries than our own and this not only to obtain a sympathetic understanding of our fellow nations, but to get a better outlook on all the problems confronting our own. In this country not enough stress has been laid so far on the necessity of the study of economic problems.

The attainment of political freedom is a legitimate and right aim, but political freedom without economic freedom is after all but slavery or the first step to slavery and to the loss of political freedom, as history has shown over and over again.

To you young men of the present time comes indeed a splendid opportunity, the opporunity to have a share in the building of a nation —to choose your ideal of the India of the future—to make that ideal as beautiful as possible and then to strive to attain that ideal with all the burning enthusiasm, all the pluck and endurance of which you are capable. To attain it within your life time should indeed be your aim. This may seem impossible, but what a united nation can do in attaining its ideal within a single generation, Japan has shown.

But before throwing your whole self in such a way into the task of nation building, you must not only see that your ideal is a wise one, but you must study the means to obtain that ideal.

Let us consider the present condition of India. We have over 80% of the population engaged in agriculture and only a very small percentage in industrial life. The need of industries in order to have a healthy and independent national life is keenly felt in India to-day, so keenly indeed that there is a tendency to think that in industrialism lies the safety, the happiness, the prosperity of India in the future.

But let us look at other nations, at those called industrial. Are they independent? Are their people prosperous? Are they happy? Does industrialism bring a golden age in its train?

But a short glance at the industrial cities of the West will answer these questions in the negative. The late war showed that industrial England was dependent on other countries for food, for the very continuance of the life of her people.

Industrialism neither makes for independence, nor does it make for happiness, at any rate not as carried out at present.

And there is a great danger that India may take a wrong turning at the present cross roads and endeavour to become industrial to the detriment of her life as a nation. Several warnings in this direction have indeed already been uttered by far-seeing persons.

Does this mean that India should remain as at present an agricultural country, with 80% of her population engaged in agriculture? No! by no means, for this is as wrong and as extreme a position for national prosperity and national economic independence as is the excessive industrialism of the West.

In a mean position lie true independence and prosperity. India must certainly have her own industries, which will supply her with all the commodities required for all the necessities of the life of her people and for her life as a nation, and indeed with an excess of some of these for exchange with other nations in return for such luxuries as she may wish to purchase from them.

But no very deep thought is required to see that as long as mankind have physical bodies, so long will the prime necessity for the existence of a nation be food for those bodies. Agriculture is then necessarily the basal occupation, from which all other occupations will spring,—the foundation on which the whole superstructure of the nation will rest. Moreover agriculture is not merely the base of physical life, but to quote one of your own modern students of these problems,—"As we look at the growth of a nation we see that the

higher forms of cultured expression are in a way linked with agriculture. You do not have a high development of art, or of music unless you have a nation which is agricultural. It is not the machinery-loving nations which produce the finest products of the human spirit. There is a subtle relationship between the soil and the intuition in man, and therefore agriculture must be the basis of the nation, if the nation is not merely to be materially strong but also spiritually strong."

It is clear then that for the right development of a nation along sane lines as far as the physical, mental and spiritual needs of the nation are concerned, agriculture should take the high place in the life of a nation, which its importance demands.

Those concerned in this aspect of national service,—for national service it is,—will necessarily be of several grades;—those who direct at the one end, and those who actually labour on the soil at the other, but all should rejoice in their work, should feel the joy of serving their Motherland in this way. The man who makes the soil yield a higher increase is the benefactor of his country and must be respected as such.

In order to attain to an ideal India in this most basal aspect of agriculture, you young men must study agriculture even more after leaving your agricultural college than during your student days.

As you return to your villages you should endeavour to organise village life into an ordered series of activities, such as existed in the past,—in the days of India's greatness.

As a student of these days has said :—

"In ancient India the village was a definitely organised unit of the nation, villages were grouped in tens, these groups of ten grouped again in hundreds and so on. Now that system has gone and nothing has taken its place. In every place where there are a large number of villages and large numbers of the population are engaged in agriculture, we ought also to have village industries. There are times in a seasonal occupation like agriculture where a great deal of leisure is

laid on the hands of the cultivator; in all countries which have been organised in village communities, village industries have also been well developed. If you read any of the old inscriptions which describe the occupations in Indian villages, you will find there were the artisans who supplied the needs of the villagers,—you have the village weaver, spinners, carpenters, ironsmiths and many others. The result was that the needs of the villagers were largely supplied by men in the village who received in exchange a piece of the common land which was cultivated for their benefit. The land was held largely in common and given to individuals for cultivation. That system in its entirety has passed away, but there are parts of which should be revived; that is, there should be village industries, in which people can be employed in addition to agricultural work, so that the village might not be so dependent as it is to-day on exporting its produce and in buying in towns what it wants"

The root of the ancient prosperity was agriculture, and the root of India's future prosperity is necessarily agriculture, and no greater national service can be conceived than of reviving successfully agriculture in its best form.

In trying to do so, the development of agriculture in Europe and in America must be carefully studied and as carefully adapted to the conditions which obtain in this country. It has been said that an increase of one bushel per acre in the cereal crops of India would be sufficient to pay all the taxes. Here then lies a splendid field of work, we have to unlock the gates of wealth present in the soil.

How is this to be done? Primarily by the uplift of the raiyat class and to attain this there must be aroused the feeling of organic unity in the villages. The sons of large landowners must study agriculture, they must be fit leaders for the raiyats, they must become leaders in agricultural co-operative combines, in agricultural industries, experts in agricultural economics

They must see that the sons of the raiyats have a vocational education, and this vocational education must fit them not only as

agriculturists, but as citizens of their Motherland,—must give them the self-respect which comes from the consciousness of filling a useful, an honourable, part in the organic life of the nation.

The whole social life in the villages requires to be uplifted, to be brought back to the ancient basis of mutual service between the various sections of the community, and of fellow-service to the Motherland.

In such a short paper, it is impossible to develop my theme, impossible to show you in detail how by travelling exhibitions, by the distribution of vernacular pamphlets and seeds, by cattle shows, by exhibitions of implements and of horticultural products, by the institutions of village granaries on a co-operative basis, by demonstration farms with their vocational schools, by instruction in home industries and by many other means, this service to your motherland can be rendered.

My aim will have been accomplished if I have given you some indication of the imperative necessity for a thorough study of agriculture and of agricultural industries at the present time, and if I have given you a glimpse of the absorbing interest, of the intense joy to be found in serving your Motherland along the lines of Agricultural Re-construction.

Harvest Exhibitions.

BY BADAMI VENKATA RAO, L. AG.

Mr. Badami Venkata Rao delivered an extempore speech on "Harvest Exhibitions" in the course of which he said, that in Mysore they had been following a novel and a very popular method of reaching the ryots and spreading such agricultural improvements as had been tested on State Farms. This was effected not merely by holding big costly exhibitions in a few isolated cities, but by arranging small Exhibitions in important villages, where agricultural officers would collect a number of ryots and

make an award to them of money presents varying from Rs. 1/- to 5/- for specimen exhibits of earheads and similar agricultural products of notable shape or size or for similar simple improvements in other directions. The State had found that this move had brought about the required change in the attitude of the ryot and had wrought more real improvement and in a shorter period of time than did the orthodox exhibitions, the agricultural stalls of which were neither encouraged by the literate public nor appreciated by the ryot population.

In support of his statement, Mr. Venkata Rao exhibited mounted specimens of earheads of Ragi of different strains, of which one was whitish in colour and all had a remarkably large number of spikelets, and compared them with the average local Ragi earhead. He also showed a few other samples, which illustrated the several stages through which the improvement of this particular crop had passed, as a result of the study which he had taken up during the past eight years.

As an agriculturist with an abiding interest in the welfare of the State, he was proud to mention that the selections he had made were attested to be good by the ryots, and had been grown this last season over a total extent of over a lakh of acres, out of a total area of over two million acres under cereals and that his selection gave an increased yield of 33% over the local variety.

In reply to Mr. T. V. Rajagopalachari, who wished to know if the white variety was the one Mr. Badami referred to as being under cultivation on a very large area and whether it had become very familiar to the ryots, Mr. Badami said that his selections were very well known to the ryots and this particular one was just being issued out.

Rao Bahadur J. Chelva Ranga Raju congratulated Mr. Badami on the excellent work he had been doing for the past

eight years and said that, given equal opportunities, any agricultural student ought, under similar circumstances, to do equally well even in British India.

Mr. Wood, while appreciating Mr. Badami's work, remarked either that agriculture in Mysore should be in a bad state to score an improvement of over 33% in yield of Ragi in one year or that Coimbatore agriculture should be far too good to be unable to show such results.

The management of Saline soils*.

BY B. VISWANATH.

One of the important problems presented by the agriculture of this presidency is the occurence of alkaline or salt lands. A white incrustation on the surface of a soil indicates alkalinity. In other cases patches of damp looking soil occur which maintain a a certain degree of moisture. The white incrustation is the salts of the soil brought to the surface by the soil water which is there evaporated, whilst the darker moist patches are salts, similarly brought up, which happen to be hygroscopic in nature. When the amounts of these salts are comparatively small, the result is that germination of seed in the land is poor, and subsequent development stunted. Patchy, inferior crops are thus produced. As the percentage of salt increases the effects are more and more obvious in the crop and more and more water is necessary to bring the crop to maturity. Finally, when the quantity reaches a still higher figure, the lands become unfit for cultivation, and are generally known as "Alkali" or "Salt" lands.

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*This paper by Mr. Viswanath is published in an abridged form as the full paper dealing with the purely scientific aspect of the problem is being published as a Memoir of the Department of Agriculture, Mesopotamia.

The formation of these salts is largely due to climatic reasons. A soil exposed to the natural agencies of rain, drought, heat and cold changes gradually its chemical nature. In this process salts are produced. If the rainfall is insufficient to leach out these salts into the subsoil, whence they would pass normally by springs and rivulets to the main drainage of the tract, they accumulate in the upper soil. Some are useful plant foods and may be used up as such by natural vegetation or by crops. Others are useless to crops and when accumulated to a sufficient degree are harmful.

Even plant foods, if their accumulation is sufficiently great become harmful, and eventually inhibit growth.

Dr. Harrison in an article in the Year Book of 1918 has drawn attention to the nature and extent of saline soils occuring in this presidency. Although they occur in isolated patches they are distributed throughout the Presidency except in the Nilgiris Wynad and other places of high elevation. They do not occur also on the slopy westcoast where the rainfall is upwards of 100 inches and fairly well distributed.

Barring a few exceptions, it may generally be stated that the occurrence of salts may be directly traceable to one of four main causes.

1. Imperfect drainage of an entire tract resulting in accumulations of salts formed by weathering.

2. Accumulation of salts by evaporation of seepage water from the rivers at the soil surface.

3. Accumulation of salts due to similar seepage from canals.

4. Accumulation of salts from water applied as irrigation water.

The amount of soluble salts which the ordinary cultivated plants will tolerate is a very variable figure, depending on a great many factors, such as nature of salts, nature of soil, nature of the crop, climate etc.

The salts that usually occur in saline soils are the carbonates, chlorides and sulphates of sodium, calcium and magnesium. Some or all of these salts may be found in a saline soil. Sodium carbonate either alone or in proportionately larger amounts than the other salts contributes to the formation of the socalled "black alkali," while the presence of salts other than sodium carbonate is responsible for the socalled "white alkali."

Captain J. F. Webster and myself have studied the problem of salt formation and the rationale of management of the saline soils of Mesopotamia and the results of our investigations and observations may be held to be applicable to the soil of this presidency also. I do not propose to worry you with the technical details of the investigation, but only place before you the general conclusions arrived at and the practical aspect of the investigations.

The practical aspect of the salinity problem so far as it is elucidated by the experiments may be stated as follows.

When the soil solution, as it may be deemed to exist in a soil, which has a moisture content equal to its minimum capillary capacity to a depth off our feet, has an osmotic pressure of more than six atmospheres, the soil may be considered too saline for ordinary agricultural purposes. Crops such as wheat and juar will be greatly stunted in growth and their germination will be greatly impeded.

Other crops may be more resistant, and still others even less so, since the powers of accommodation of plants to such conditions vary considerably. In general, however, a soil solution of osmotic pressure greater than six atmospheres, will be sufficient to prevent the successful growth of farm crops.

When a water table exists in the sub-soil at a slight depth the conditions are modified greatly, and by upward translocation of salts with the capillary moisture, the whole of the salt down to this sub-soil water level may be moved up into the top six inches Particularly is this liable to happen in the ordinary preparation of a seed bed.

Established plants will not feel this accumulation, since it forms an incrustation on the surface and is harmless, unless washed down by irrigation or rain water. In this connection it is interesting to note the fallibility of field observations on salinity. A crop may be growing well in soils which contain enormous amounts of soluble salts. These plants are feeding on the comparatively sweet subsoil water, and the salt is present as an accumulation on the surface. Irrigation may kill the crop, by washing down these salts into the feeding zone of the plant. Under such circumstances extraordinary care is needed to prepare a seed-bed sufficiently free from salt to permit of growth, and as a rule this can only be compassed by the digging of drains.

The most serious effect of salts on the plant is to cause shortage of available water. The cultivator of salty lands will therefore benefit by applying most of the particular methods of cultivation which have proved successful in "dry farming."

The seedling plant is most affected by salty conditions and only by taking great care at this critical stage of the plant's life will successful crops be produced. The particular precautions to be taken in cultivating soils with a tendency to saltiness are given below.

Ensure a good start for the seedling plant. This may be done (a) by soaking the seed for as long a period as practicable before sowing.

(b) By giving a second irrigation soon after sowing even though the soil be apparently moist. This will wash down accumulated salts from the surface and allow the germinating seed to make its first growth in a sweet environment.

(c) Whenever practicable sowing should be done in dull weather when evaporation is low. The excess water of the soil is then lost by percolation rather than evaporation, and concentration of salts in the upper layers of soil is lessened. In addition to this the plant's water requirements are less under these conditions.

(2) *Reduce evaporation from the surface soil.*

The succesful achievement of this object is very important, since so many benefits accrue therefrom. Excessive concentrations of salts are prevented, water requirements of the crop are reduced, and the percolation is increased, which in turn increases the amount of soil wetted, thereby increasing the plant's root range, and diluting the strength of the soil solution as it exists at the minimum capacity of the soil. The means by which this evaporation reduction may be brought are about follows.

(a) by furrow irrigation instead of flood whenever possible.

(b) by the avoidance of soil pans, which prevent percolation and cause all excess water to be evaporated.

(c) By mulching as soon as possible after every irrigation.

(d) By digging drains.

') *Increase the water holding capacity of the soil.*

Successful accomplishment of this object is followed by a roportionate dilution of the salts in the soil water and consequent reduction in osmostic pressure.

It may be assured by the following methods.

(a) Frequent and copious applications of organic manure.

(b) By thorough and good cultivation, and consequent good tilth.

(c) By less frequent irrigation greater in amount than those normally given preceded by sub-soil cultivation if this is found to be necessary. This causes a greater depth of soil to be wetted and the salts are thereby diluted. In addition a deeper rooting habit is given to the plant which is of great importance in all soils, but particularly more so in those which are at all salty.

The evil affects of frequent insufficient applications of irrigation waters are usually attributed to the restoration of capillary connection between the surface soil and sub-soil waters, and consequent renewed losses by evaporation. Under the conditions under

which such irrigations are usually given however, it is unlikely that any serious loss, over and above that of the water added, could ekta place. It seems much more probable that the undoubted ill effects which follow, are due to the encouragement of formation of root hairs in the top soil layer, which have no sooner begun to function than they are destroyed by lack of water. In this way a plant may be gradually killed. Similarly hoe-mulching of root hairs at the surface thereby increasing the formation inhibits the formation at lower depths, and rendering the plant more drought resistant.

(4) *Reduce the surface tension of the soil solution.*

If this can be achieved the moisture content of the soil at the wilting point will be minimised, and consequently a greater proportion of the water actually applied as irrigation water will become available for the plant.

This may be done by the copious application of organic manure.

(5) *Prevent whenever possible accumulation of sub-soil waters.*

The effect of such accumulations of water is, as has been previously pointed out, to concentrate practically the whole of the salt in the upper layers of the soil. This is disastrous particularly for seedling plants. Where sub-soil water tables exist at a slight depth, there is only one real remedy. This is the provision of a drainage system.

If the above precautions are taken in the cultivation of saline lands it is highly probable that increased crops may be obtained, and that much land which is otherwise unsuitable for cultivation may be utilised.

Discussions "on the Management of Saline Soils" by B Viswanath.

Mr. R. Cecilwood, M. A.

From a long experience gained in the actual application of water in irrigating crops, I would emphasise the importance of infrequent heavy applications as against frequent light ones. It is true, that it is not so easy to apply water in this way, but I

am convinced that better use is made of the water. Certainly from the particular point now being discussed, namely the avoidance of alkalinity, I agree with Mr. Nath that light waterings are dangerous, they tend to keep a continuous layer at the surface, encourage evaporation and the upward movement of water, and so assist in the accumulation of salts at the surface which is the direct cause of the trouble.

Rao Sahib Ramaswami Sivan referred to the work done on alkaline soils in Egypt and America and said that the limits of toxicity for the various salts as found by Hilgard working with Oats, Peas and Lupines were different from those given by Messrs. Nath and Webster. He also pointed out that the views of the authors with regard to sodium carbonate were somewhat opposed to the generally accepted opinion and suggested that this interesting and important piece of work should be continued. Mr. Nath, in reply to Mr. Ramaswami Sivan said that his observations were based on experiments made with Barley and Cholam. He said that work, on limits of toxicity of various salts, done in America and elsewhere was done under conditions which could not be said to be an imitation of field conditions in any degree and claimed that in the new method of experimenting devised by captain Webster and himself the conditions were very much nearer to those obtaining in the field.

Coconut cultivation in the Laccadives & Minicoy Islands.

BY K. G. NAMBIAR, L. Ag.

The object of the paper is to present in a concise manner an idea about the general conditions and the coconut cultivation of the Laccadives and Minicoy Islands which I had an opportunity to visit in November 1920. The very limited time spent on each Island has precluded me from making a detailed enquiry

into the practices and needs of the islanders. Before dwelling on the subject proper, a brief description of these remote islands, will, I hope, be of interest.

The Laccadives are a group of small islands of coral formation off the Malabar Coast. The Northern groups are attached to the South Kanara Collectorate and consist of the inhabited islands of Amini, Kiltan, Katamath, and Chatlat. The southern portion is attached to the Malabar Collectorate and consists of the following islands:—Agathi, Kavarathi, Androth and Kalpeni. The island of Minicoy known also as Manakayam is separate from the Laccadive group and is the northern most island of the Maldive group. Here there is a light-house which is about 250 feet high. Besides the above there are a number of very small dependent islets scattered in the group. The islet of Viringelli near Minicoy is sometimes used as a segregation place for the small-pox patients of Minicoy. The other islets I visited are Kalpatti, Bengaram and Thinnakara.

The approximate distance from the mainland, area and poulation of these islands are given in the following table:—

Name of the islands.	Approximate distance from the mainland.	Area in acres.	Population (census 1920).
Amini ...		622	2,148
Kiltan ...		397	675
Katamath ...			577
Chetlat ...		255	761
Agathi ...	218	688	1,05[illegible]
Kavarathi ...	195	865	[illegible]6[illegible]
Androth ...	139	1,067	[illegible]9[illegible]
Kalpeni ...	147	494	1,375
Minicoy ...	250	1,120	3,093

Physical Aspects. The topographical features of all these slands are identical. Each island is contained within a coral

reef stretching generally from north to south. In all the islands on the western side there are extensive lagoons intervening between the shore and the sea. The scenery of the lagoon at Agathi is very interesting. Adroth has no lagoon worthy of the name and this island, unlike the others, lies in an east-westerly direction. The islands are almost flat, but in the interior of each island small inequalities are observed. They are mostly of artificial origin and in only few cases they present the nature of sand-dunes. The elevation is nowhere more than 10 to 12 feet above the level of the sea.

People. The inhabitants are all Mohammadans (Moplahs) speaking Malayalam which differs slightly from that spoken on the mainland. At Minicoy the people are Mahls and speak the Mahl language. A few goldsmiths are found in almost all these islands. These are the emigrants from the mainland who have come and settled here for making jewels. The island Moplahs are divided into different classes:—(1) Tharvadies—Karanavans (2) Koyas (3) Kudiadees or Malmis (4) Melacheris (tree climbers and tappers). The Karanavans are said to have descended from the Nambudiris and Nayars of Malabar and the islands of Adroth, Kavarathi and Kalpeni are still known as the Tharvad Islands. The Melacheris claim descent from the Thiyyars of Malabar and Agathi is said to be a Melacheri island. At Minicoy the people are divided into four classes:—Malicans or Karanavans (2) Malmis or boatmen (3) Thakkarus or sailors (4) Ravethis or tree climbers. The women of these different classes have different titles. Thakkaru women hold the title of Bibi, Malmi women, Bifan and Malikkan woman, Malikka. In every island the land and the headship are vested in the highest caste and labour in the hands of the lowest class. There is no intermarriage between the highest and lowest classes. There is some discontent and unrest between the higher and lower classes in all the islands except Minicoy. At Minicoy the people live in a compact village divided into wards called Attiris. There is good discipline here in each ward in everything. In social

matters also Minicoy is much in advance of the rest. Here there are clubs for both men and women. A description of the Ladies Club at Minicoy will, I hope, be interesting. The room is built like the saloon of a large sailing vessel with roof, scuttles, port-holes etc. The wood-work is beautifully carved and painted in different colours. Round the sides of the room, benches are put up, on which they sit and make coir with their children playing in the centre. The women wear long red chemises reaching from the neck to the ankle. Men's clubs are quite plain in all the wards and it is from here that they train the troupes of dancers for each ward. Their performances are remarkable for their uniform dress and precision in every act. Moplah women of all these islands observe no Ghosha system as is done in the mainland. At Minicoy especially it is the women that take the lead in everything. The inhabitents of all these islands are quite hospitable, contented and cheerful.

Dwellings. Houses are built of quarried slabs of coral stones with a fine coating of washing. Coral stones burnt in pits and mixed with sand make fine mortar for building construction Tiled roofs are of recent introduction and are seen occasionally here and there. Very poor people live in small sheds made of plaited coconut leaves. Dwellings are more or less in a consolidated nature in the middle of each island. Most of the houses are ill-ventilated and kept dirty.

Soil. The soil is a fine white sandy loam, porous but not too dry. The soil extends to a depth of about 10 or 12 feet where a sub-stratum of coral limestone is found. In some places loose coral stones alone are found, Waste lands are numerous and good pastures are also found. Some of the extensive Pandaram lands (Government lands) are being leased out for planting coconut trees with certain stipulations. Thick growth of shrubs and screwpines (pandanas) make penetration impossible in some places. The accumulation of humus formed by the decomposition of plants for many years has added greatly to the fertility

of the soil. The presence of lime, (since the islands are of coral formation,) also forms a valuable asset and contributes greatly to the fertility of the soil.

Tanks and Wells. Small-sized tanks are found everywhere. Those near the mosques are beautifully lined with slabs of coral stones. Circular wells with parapet walls are of recent introduction and about half-a-dozen wells of this kind are found in some islands only. Everywhere fresh water is found at a depth varying from 5 to 8 feet but it is affected by the tide and rises and falls accordingly. The water in some of the wells is not very wholesome.

Climate and Rainfall. The climate is insular and extremes are never experienced. The rainfall is about 50 to 60 inches and its distribution is the same as in the West Coast. There is a Meterological station at Amini,

Crops. Coconuts form the only contribution towards the resources of these islands. But for this, these islands would have been quite uninhabitable. In small excavations in the centre of the islands of Androth, Agathi, Kavarathi and Kalpeni, paddy, ragi, sweet potato, cowpea and colocasia are cultivated on a very small scale. At Kalpeni a small plot of sugarcane was noted. Bread-fruit trees (Artocarpus incisa) are grown largely in every island amidst coconut trees. I was told that lime trees were once growing very well in all these islands especially at Amini. Now only a few trees are noted here and there. Lime fruits ripen here in August-September when there is no communication with the mainland and so the fruits cannot be marketed. At Minicoy betel vines were found grown largely on coconut trees. Around the dwellings, pomegranates, melons, papayas, plantains, moringai, (horse-radish) betel vines and cholam were grown enclosed by plaited coconut leaves. There is a shrub known locally as Wagai which is quite different from the mainland Wagai. These are grown near the houses and the leaves

are made use of in removing oil during an oil bath. On the beach side, a shrub locally called chentalam (Pemphis acidula) is found growing wild. In the uninhabited islet of Vengaram and Thinnakkara a plant known locally as Eathul (Dioscoria oppositifolia) is found grown in abundance. The islanders make a fine edible colour out of the tubers. Screw pine flourishes everywhere. The other trees found growing in these islands worth mentioning are Thespesia, Ficus Bengalensis, wild almond, *Zizyphus jujuba* and tamarind trees. Shrubs of Calotropis were also noted in some islands. Leguminous plants, Desmodium and Kolingi were observed here and there. In waste lands grasses of the species Andropogon, Eragrostis and Ischaemum were found growing luxuriantly. Lantana has made its appearance and is growing largely at Kavarathi.

Implements Bill hooks and a few Mammutties form the sole implements of the islanders.

Live Stock. Cows and goats are found in small numbers in each island. They are brought from the mainland only. There is no regular breeding done here. These are slaughtered at times and their slow increase in numbers may be attributed to this. Grazing is done in the coconut garden and pastures. Beyond this no special care is bestowed on them.

Poultry. Fowls are plentiful in all the islands. In the absence of the natural enemies of fowls such as snakes, crows, kites, jackals, and dogs etc', poultry farming has a bright future In other birds the islands are singularly defective. A few crows were found only an Androth and Kalpeni.

Insects. Insects are few. Some of the common wasps houseflies and eyeflies are found in all the islands. The mosquitoes of Minicoy and the sandflies of Agathi will ever be remembered by visitors. At Minicoy the mosquitoes were found breeding in Thondus (coconuts eaten by rats) which may be found scattered throughout. These thondus with rainwater collected

therein remain on the ground until they decay. I would strongly advise any one intending to visit this island to provide himself with a mosquito curtain. Even the poorest people there sleep under curtains. At Kiltan the leaves of some coconut trees were found eaten by grasshoppers. It appears that the attack occurs in the months of June and July. The rhinoceros beetle contributes its share of damage to coconut trees in every island. The accumulation of rubbish, rotten stems of coconut trees, and decaying vegetation form a congenial breeding place for the grubs of these beetles. Fallen nuts and seedlings are sometimes found destroyed by hermit crabs. They are found lodging inside shells of coconuts.

Rats The damage done by rats is neither insignificant nor transient. I think it will not be an exaggeration when I say that in some islands the loss due to the ravages of rats amounts nearly to 50 per cent. of the normal produce. Although the islanders have begun to realise the importance of the damage, the measures adopted for combating it are neither perfect nor satisfactory. Of the various devices of the islanders, in which their simplicity and dexterity are manifested the plaited leaf collar tied round the stem is peculiarly interesting. The principle involved is the same as in the same zinc sheet collars used here in the Central Farm. In spite of repeated rat huntings at regular intervals and use of rat traps of various designs there is no decrease in the amount of damage. Isolation of individual trees and regular cleaning of their crowns may do some good. The rats are found breeding on the crowns of trees only. In some islands, specially at Amini, the whole grouud is, as it were littered with rat-eaten coconuts.

Boat Building. The islanders are expert in boat building. The timber required is brought from the mainland. The boats are quite different from those found on the mainland. The planks are sewn together by means of coir ropes and caulked. They

make large coasting vessels known as Odams as well as small rowing boats. The boats found at Minicoy are peculiar and much better than those found in other islands. The mass boats and racing boats of Minicoy are particularly interesting and of special designs.

Fishing. Fishing is done in all the Laccadives group on a very small scale only. There very good facilities for fishing in these lagoons. There are different kinds of nets called Kandavala, Olavalai, Veesuvalai, Adivalai, etc. Fishing outside the reef is done by lines and hooks only. Fish is caught also by harpooning both during day and night. During day time, a wooden dummy called poymeen (false fish) made of small pieces of breadfruit timber and painted in different colours is floated in water and when fish approach they are harpooned. At night with the help of a torch harpooning of pipe fish is done. There are also peculiar traps used for catching fish from the lagoons. Some of the common fishes found here are seer, flying fish, shark, sword fish, skate etc. Green turtle is present everywhere and is locally known as Mirugam. Turtle eggs are taken whenever found on the beach and are eaten by the islanders. The sea slug, Holothuria (sea cucumber) is plentiful in every lagoon. The mass fishing at Minicoy deserves special mention as this industry has developed successfully and the income from this source is estimated to be about Rs. 25,000 per annum. The mass fish (Bonito,) which is a large species of mackerel is caught in nets by using live baits which are caught and kept alive in fishing boats of special designs

The island trade. There are no big shops or stores to sell or buy the necessary article of daily life. When the odams or the island vessels return from the mainland after disposing of copra, jaggery, coir etc., the necessary articles are purchased and brought. There are Dalals or middle men on the mainland to whom the current of island trade flows at present. The sailing of

Odams takes place in the months of October-November and lasts till May. There is the system of bartering of every article for coconuts from these islands. It was observed on several occasions that one good coconut is given for one or two beedies, betel leaves or a piece of tobacco. The chief exports are island coir, copra, jaggery, coconuts, plaited leaves, fire wood, shells, cowries etc. The chief imports are cattle, goats, rice, cloths, arecanuts, tobacco, kerosene oil etc, in short all the daily requirements excepting coconuts jaggery and oil are imported.

The economic condition of the islands. People who work for daily wages are very limited. As remarked before such people are the dependents of the higher classes Tharvadis or Koyas. There is not much of money transactions in the islands Their savings are to a great extent utilised for making jewels. On the whole there is more of economic deterioration to outward appearance than improvement. But there are possibilities of improvement in several directions.

Education. There are elementary schools at Agathi, Amini and Kalipeni. It was a strange sight to me to see robust Moplahs aged 20 and 25 attending the 3rd and 4th standards. Regarding education the islanders as a class are backward.

Health. Epidemics such as small pox and cholera pay occasional visits. Medical aid is afforded in the South Kanara islands by the presence of a Sub-Assistant Surgeon stationed at Amini. The general sanitation of the islands on the whole is better than the mainland. Some of the common diseases found are eye and skin diseases.

Tenancy and ownership of lands. The property possessed by these Moplahs is of two kinds (1) ancestral property known as Velliyacha property or Friday property for which Marumakkathayam system is observed. (2) Self-acquired property known as the Thinglacha property or Monday property for which Makkathayam is observed. The custom regarding tenancy is peculiar

and almost feudal in character. For trees given to tenants, one tenth of the produce will have to be given as rent and also etc. ire to the landlord. The important service will be to [illegible] as to the mainland and back, to attend festivals, thatching houses etc The right of plucking nuts from the uninhabited islands is generally auctioned out by the inspecting officer for rent for five years or less at a time on condition that a specified number of seedlings must be planted during each year of the period of lease. Lands are owned in the islands by the number of trees and not by acres and cents. All trees bear the owner's property marks

Coconut cultivation. The easy going life of the islanders will strike anybody who visits these islands, which can be properly called 'groups of coconut forests.' Planting is done very close. Due care is not given to the judicious choosing of planting sites, selection of seed nuts and management of garden. The nuts obtained here are usually very small. Very long leaves are found on trees growing in absolute shade and most of the trees are without fruits. Under—plantings are done indiscriminately and do not receive enough light and breeze to make them vigorous and healthy. Nuts differing in form, colour etc., are given different names, but the more conspicuously different varieties are very few. There is a variety called Kaitha thali the husk of which is very sweet . For decorative purposes trees with nuts of different colours are cut and brought completely Under favourable conditions trees attain general bearing in 6 to 7 years.

Seed nuts and nursery. Seed nuts are selected from heaps of nuts at any time when they show signs of germination. The seed bed is invariably chosen in an illdrained place where there is the most shade and is always kept weedy.

Planting. Planting is done on the surface [illegible] planting from the seed bed is customarily postponed [illegible] 3 or 4 years. Planting seedlings in groups is [illegible] adopted. Here the outer ones alone thrive better.

Cultivation and manuring. These operations are unknown to the islanders. Even the faintest attempt is not made towards manuring the seedlings round the dwellings with the ashes collected daily from their houses or to remove the weeds that grow thick round the seedlings.

Diseases. Bleeding disease and Pestallozzia were noted everywhere, but nowhere is it on an alarming scale. From what I could gather from the islanders and from my own observations I am led to think that bud-rot has not made its appearance in these islands.

Coir Industry. This is done on a very large scale in all the islands. Men do the work of husking and retting and women do the work of beating and spinning. Retting is done for about 10 to 12 months in coral rocks between high and low water marks on either lagoon beach or sea beach. Retting is also done in the interior of islands in fresh water ponds, but the quality of the fibre is not so good as the other. The fibre is then taken and washed in the sea water to clear the dust and improve the colour. Twisting is done by the help of hand and feet by Melacheri women. The yarn made is light-coloured and very strong. The introduction of labour-saving machinery in the preparation of the fibre and the subsequent manufacture of coir and ropes is likely to prove advantageous as the hand labour required at present is enormous. Thc best coir is made at Chetlet, but the twist of the coir made at Minicoy is superior.

Coir Monopoly. The Government have monopoly over the coir made in all these islands except Minicoy. The coir yarn is graded before purchase into three classes by the Port Authorities at Mangalore, to which place the coir is taken now. The coir is paid for one fourth in cash and three fourths in rice. The price paid for is Rs. 21-14-0, Rs. 17-8-0 and Rs. 13-12-0 per candy of 560 lbs. of 1st, 2nd and 3rd class respectively.

Copra Making. Copra making is done only during the months of December to March. The island copra known as the Divi Copra is very small in size but this always fetches a better price than the mainland copra. It appears that this copra is marketed to Bombay where it is used for edible purposes. The husking and copra making are done as in the mainland. The average yield of copra is very low. About 7 to 8 tulams (1 tulam is 28 lbs.) are obtained from thousand nuts. This may be due to the very small size of the nuts. As copra making is not done throughout the year introduction of artificial driers may be useful in making copra even in the rainy season.

Oil extraction. There are no oil mills of any kind in these islands. The primitive wasteful method of oil extraction is practised even now. Scraped meat is mixed with water and boiled in copper pots. It is well squeezed out after a few hours and reboiled About one bottle of soil is obtained from 15 to 20 nuts. A large percentage of the oil is undoubtedly left in the residues and the keeping quality of the oil also is impaired by this process. Cheap modern mills for the extraction of the oil may be tried.

Tapping and Jaggery making. Tapping is done in all the islands by the Moplahs (Melacheris). Their methods of climbing and tapping are peculiar. The appliances used and the methods adopted are very simple. After the juice is seen dripping the spadix is removed and the inflorescence tied firmly by coconut leaves. Bamboo pieces or coconut shells are hung to this spadix to collect the juice. There are no mud pots at all. Lime is not applied in the receptacle. Tapping is done twice a day. The tapping season commences in October—November and lasts till May-June. Boiling is done in copper vessels only. Coral stones are put in the juice while boiling. When the juice attains the syrupy consistency the vessel is removed from the fire and stirred briskly with a wooden rod about an hour and kept in jars or kerosene tins and exported to the mainland.

Conclusion. It is much to be regretted that the care and culture bestowed on coconut trees of these remote islands are not satisfactory.

All the islands are better favoured by nature and the only disadvantage is that they are far from the mainland. The islanders as a class are sure to adopt easily the improved methods of cultivation etc., if their utility can be practically demonstrated. The fall in the yield of nuts is now being increasingly felt year after year and the time has now come to attend to the proper spacing, cultivation and manuring of the trees, though the natural fertility has contributed for some time to giving a more or less steady yield. These remote islands deserve the early attention of the Madras Agricultural Department.

Discussion on "Coconut cultivation in the Laccadives."

Mr. H. C. Sampson C. I. E., Director of Agriculture— in complementing Mr. Nambiar on his very interesting paper, remarked that a study of the economic condition of the people was essential, before a Demonstrator doing District work could attempt to bring about agricultural improvements. He was of the opinion that all the District officers should make it a point to study the economic conditions of the tract they worked in. As regards the subject proper, he affirmed that the coconut cultivatior of the mainland had not much to learn from the islander.

Mr. Kidavu stated that he understood that proposals had been made to start a Farm in the Laccadives and that in the event of the project taking shape, effecting agricultural improvements therein would be an easy matter.

Rao Bahadur J. C. Raju enquired of the writer if he could inform the conference if tapping was considered more profitable than the gathering of the nuts for sale and if he had studied the comparative economics of the sale of nuts and the yield of jaggery. Mr. Nambiar replied that jaggery was made chiefly for home consumption. The methods adopted were crude, coral stones being put into boiling juice and the industry was not profitable.

Rao Sahib Ramaswami Sivan was of the opinion that the coral stones prevented inversion and wished to know if lime was never added to the juice.

Dr. Norris stated that while lime was beneficial in the case of cane jaggery, it was not beneficial in the case of coconut jaggery and probably detrimental.

Some Aspects of Agricultural Production.

BY E. V. SUNDARA REDDI M. A., B. L.

I must first express my thanks to the members of the Madras Agricultural Students' Union for their kind invitation to me to read a paper before this Conference. I have chosen this subject as I desired to draw the attention of the members of this Conference to certain aspects of our Agricultural production which seemed to suggest immediate consideration.

Recently in an article on "A Study in Rural Economy" I ventured to suggest that there were four things which the ryot regarded as of importance in his scheme of agricultural production. These were (1) Ploughing, (2) Selection of seed, (3) Manuring and (4) Water. I do not mean to suggest that these exhaust the factors of production but they are recognised as of overwhelming importance. I propose to deal with these and also the other factors, which we cannot afford to neglect.

First in importance perhaps is land. The character of the soil and the degree of fertility constitute undoubtedly the preeminent conditions of favourable production. There is a growing feeling which is not altogether unsupported by official documents that there has been a deterioration of soil in many parts of this presidency. The problem has naturally been engaging those concerned with the development of agriculture, namely, of preventing this process of deterioration and of augmenting the fertility of the soil. It is in this connection that the use of manures and of appliances designed to secure a deeper ploughing of the soil than what is possible with the country plough have been advocated. The possibilities of green manure have investigated

and the industries of chemical and fish manures have also come into existence here. We are all aware of the very wide use of 'Punnnac' as a form of manure. What is most needed in view of the fact that a very considerable portion of the land in this presidency is held by small pattadars is cheap manure. Our efforts should therefore be directed towards placing within the reach of the smallest cultivator, implements designed to secure deep ploughing and manures at prices which would enable him to have re-course to manuring so that he may keep up, if not increase the fertility of the soil. I am inclined to estimate that there would be at least a 15 per cent increase in our production if better appliances are adopted and the soil is treated to a more systematic manuring.

The second subject to which I must draw your attention is the size and the constitution of our holdings. On more than one occasion I have pointed out the enormous waste involved in the scattered character of the lands comprised in a holding and also the uneconomic character of a considerable number of our holdings by reason of their minute size. Improvements in agriculture are to a considerable extent hampered by these conditions and attempts ought to be made forthwith to reconstitute our holdings in a manner calculated to secure as far as possible compact areas. This subject is one which bristles with difficulties and may possibly involve changes in the laws of inheritance and succession.

I must next ask you to consider whether a rapid extension of irrigation wo ks and the development of well irrigation are not urgently called for. To me it has always appeared that the most effective guarantees of famine are in the direction of extending and utilising the resources for the supply of water. Well irrigation seems to have possibilities which are still unexplored and a vigorous effort ought to be made by the State to encourage the construction of wells and the use of oil engines for the purpose of irrigation.

This leads me on to the question of agricultural finance. In well-informed circles there is a growing feeling that the co-operative societies alone will not succeed in tackling the problem of rural indebtedness. There is a tendency to under-estimate the extent to which the ryots are indebted. But careful inquiries and detailed studies into the economics of a few villages lead to an irresistible conclusion that in spite of apparent prosperity there is a depth of indebtedness which most of us are unable to gauge accurately and there is rather an intimate connection between prosperity and debt. Co-operative credit seems to be especially failing where it is most needed as in the case of long-term loans for the redemption of old debts. It would be as well for us to see if we cannot introduce here the system of agricultural banks which have been tried with such remarkable success in Egypt and elsewhere.

It is a matter for congratulation that the Agricultural Department has been since its inception devoting its attention to the question of the selection and the improvement of seed in the case of paddy and sugarcane especially. The efforts of the Department have already resulted in an appreciable increase in production and the investigations with regard to other crops will, I have no doubt, lead to similar results.

If the measures outlined above are taken on hand forthwith the increase in agricultural production may easily reach 50 per cent and with the present proposals for declaring the assessment on ryotwari holdings permanent, the incentive to production will be larger and, with developed facilities for marketing, the ryot would be better enabled to bear the burdens imposed on him by the State and the society.

Before I conclude, there is one other thing to which I must refer, namely, the spread of Agricultural education. I do not mean by this term the task of training a limited number of

students who could be absorbed in the service of the department but what I really mean is the much larger and wider function of linking the life of the ryot intimately to the work of the department. Demonstration forms have only served in a very restricted manner to spread the object of the department but what is needed is something much larger than this. I have in my mind particularly the great work that has been done in Canada and United States in this direction by means of extension lectures and demonstrations and the lessons of America have considerable significance to us. The extent to which the department can really permeate the life of the ryots in their every day labour is really the acid test of the department's worth. In this great task of rural education it behoves us all to contribute our little shares and if this is done, I have no doubt, we can confidently look forward to that era of plenty and prosperity which the new constitution may be said to have inaugurated.

(As the paper arrived too late for the last session of the conference it was taken as read and hence there was no discussion).

President's concluding remarks :—

The President in bringing the Conference to a close said :— Ladies and Gentlemen,

Before bringing the deliberations of the Conference to a close, I should like to thank you very much for the warm welcome you have accorded me and I trust that every time I come to Coimbatore, I will pay you a visit. I should thank Mrs. Norris and the other gentlemen who read the papers yesterday and to-day to which we have listened with very great interest, and I trust, with some profit.

I just want to give one word of advice, especially to the visitors of the conference. I would advise you to get at the Administration Report of the Agricultural Department, and if you

read that Report carefully, I think you would find that the criticism about the waste of money on this Department is absolutely unfounded. You will also find that the object of the Department is not to enable rich land-holders to extract increased rent from their tenants.

I should like to thank the many visitors who have come from long distances, and on behalf of the members of the Agricultural Students' Union, I convey to them thanks for their coming so far to the Conference.

In conclusion let me announce a piece of good news, that is, of a donation of Rupees One thousand, from Mr. Vengail Krishnan Nayanar towards the establishment of a prize for the best student in practical agriculture.

(Loud applause.)

APPENDIX I.

List of winners and records.

		This year's record.
100 yards race.	1. J. Balraj 2. K. S. Ramanna Rai 3. M. J. Sadasiva Reddi	11 seconds.
Long jump.	1. S. N. Venkataraman 2. K. S. Ramanna Rai 3. M. Narasimham	18'—2½"
Puttting the shot.	1. T. B. Anderson 2. K. S. Ramanna Rai	29'—6½"
High jump.	1. C. S. Doraiswamy 2. K. K. Hegde 3. M. Narasimham	4'—8½"
Quarter mile race.	1. J. Balraj 2. M. J. Sadasiva Reddi 3. K. K. Hegde	61 seconds.

Throwing the cricket ball.	1. T. G. Anantaraman 2. M. R. Balakrishnan	84½ yards.
Half mile race.	1. C. S. Doraiswamy 2. R. Balasubrahmanyam 3. K. M. Venkatachalam	2 min. & 26⅘ sec.
do. open.	1. M. S. Ayyana, Forest College 2. Srinivasalu, London Mission School	2 ,, 18⅘ ,,
Hurdle race.	1. M. J. Sadasiva Reddy 2. K. S. Ramanna Rai	20 seconds.
Old Boys' race.	1. U. Vittal Rao 2. S. Dharmalingam 3. K. Achuta Nambiar	
One mile race.	1. C. S. Doraiswamy 2. S. M. Kalyanaraman 3. K. M. Venkatachalam	5 min. & 35 sec.
Obstacle race.	1. P. Zachariah 2. M. J. Sadasiva Reddy 3. A. K. Annaswamy	
Intertutorial relay race adjudged on 21—12—1921.	Rao Sahib M. R. Ramaswami Sivan's wards.	
Cross country race.	1. C. S. Doraiswamy 2. P. Zachariah 3. K M. Venkatachalam	38 min & 40⅘ sec.
Intertutorial Tug-of-war.	Rao Sahib M. R. Ramaswami Sivan's wards.	

Champion of the year C. S. Doraiswamy.

U. VITTAL RAO,
Sports Secretary.

APPENDIX II.

Championship records.

The record of 40 marks got by C. S. Doraiswamy for Championship this year is fairly good. It is creditable to note that he secured

first rank in four events; going through the Championship records, he can be classed as the fourth in the order of champions so far. The following are the championship records since 1911 :—

Year.	Marks obtained.	Name of Champion.
1911	39	K. M. Gururaja Rao.
1912	39	R. G. Mal.
1913	39	do.
1914	33	Venkatachala Mudaliar.
1915	32	do.
1916	53	K. S. Ramanna Rai.
1917	39	S. Dharmalingam.
1918	51	A. V. Babi.
1919	59	B. Dasappa Malli.
1920		do.
1921	40	C. S. Doraiswamy Ayyangar.

U. VITTAL RAO,
Sports Secretary.

APPENDIX III.

Athletic records.

The college records for events have also considerably improved and some of them we can certainly be proud of. The following table will be of interest for future competitors.

Events.	Record.	Year.	Name.
100 yards race.	11 seconds.	1921	J. Balraj.
Long jump.	18'—2½"	1921	S. N. Venkataraman.
Putting the shot.	29'—6½"	1921	T. B. Anderson.
High jump.	5'—0"	1913—14	U. Vittal Rao.
¼ mile race.	61 seconds.	1919	B. Dasappa Malli.
,,	,,	1921	J. Balraj.
Throwing the cricket ball.	97 yards.	1918	A. V. Babi.

Half mile race.	2 min and 26⅘ sec.	1921	C. S. Doraiswamy.
Hurdle race.	18⅘ seconds.	1919	T. Seshachari.
One mile race.	5 min. & 4"	1918	K. S. Krishnamurti.
Cross country race.	38 minutes.	1919	K. S. Bhandary.

U. VITTAL RAO,
Sports Secretary.

APPENDIX IV.

The list of newly elected Office-bearers.

PRESIDENT:

Principal *ex-officio.*

VICE-PRESIDENTS :—

Resident : Mr. C. Tadulingam.

Mofussil : Rao Bahadur J. Chelvaranga Raju Garu.
Mr. D. Ananda Rao.
Mr. D. Balakrishnamurti.

WORKING COMMITTEE.

Vice-President : Mr. C. Tadulingam.

General Secretary : Mr. B. Viswanath.

Treasurer : Mr. M. Anandan.

Editor : Rao Saheb Y. Ramachandra Rao.

Sub-Editor : Mr. V. Muthuswami Iyer.

Manager : U. Vittal Rao.

Members : Rao Saheb M. R. Ramaswami Sivan.
Mr. T. V. Rajagopalachari.

Auditors : Mr. V. Ramanathan.
Mr. K. Krishnamurthi Rao.

APPENDIX V.

Diplomates in Agriculture, December, 1921.

1. Govindan Nambiar, E. K.[a]
2. Krishnamurti Ayyar, K. S.
3. Krishnan Nayak, S.
4. Krishna Rao, P.[b]
5. Kunhunni Nambiar, V. K.
6. Rama Rao, K.
7. Ramaswami Ayyar, A.
8. Sakkaram Rao, G.
9. Seshagiri Ayyar, C. S.
10. Sitaram Sastri, G.
11. Srinivasachari, K.
12. Srinivasa Rao, N.
13. Subbiah Mudaliar, V. T.[c]
14. Vasudevarao Nayudu, R.[a]
15. Venkatarama Ayyar, S.
16. Vijayaraghavachari, C.
17. Viswanatha Ayyar,

[a] **D'Silva Prize (equal).**
[b] **Keess Prize.**
[c] **Robertson Prize.**

APPENDIX VI.

List of Departmental Visitors.

Gazetted Officers.

H. C. Sampson, Esq., B. Sc., C. I. E., Director of Agriculture.
Mr. D. G. Munro.
,, D. Balakrishnamurti.
,, P. H. Rama Reddi.
,, M. Govinda Kidavu.
,, C. Narayana Ayyar.
,, N. S. Kolandaswami Pillai.
,, K. Gopalakrishna Raju.
,, S. Subrahmanya Ayyar.
,, A. V. Thirumuruganatham Pillai.
,, R. C. Broadfoot.
,, Littlewood.

Subordinate Officers.

Mr. T. R. Venkasami Rao.	Mr. P. Abhishekanatham Pillai
,, C. S. Madayya.	,, E. Kunhappa Nambiar.
,, K. Narayana Ayyangar.	,, K. Govindan Nambiar.
,, M. A. Balakrishnan.	,, S. Subbayyar.
,, V. Muthayya Nattan.	,, A. Venkatarangam.
,, K. Raghavachari.	,, U. S. Ayyaswami Ayyar.
,, Aaron Yesudasan.	,, S. Sithapathi Rao.
,, S. R. Srinivasa Iyengar.	,, P. S. Venkuswami Ayyar.
,, S. Sitarama Patrudu.	,, G. R. Venkatachalapathy.
,, G. Jogi Raju.	,, P. V. Hanumantha Rao.
,, K. Balaji Rao.	,, S. K. Hanumantha Rao.
,, K. G. S. Bhandari.	,, M. V. Kondala Rao.

Mr. K. M. Thomas.

From Pudukotta :—

Mr. K. R. Sankar.

Mr. G. Doraiswami Ayyangar.

From Mysore :—Mr. Venkata Rao Badami.

WANTED.

"Wanted teachers who could impart instruction in the Elements of practical agriculture to the pupils of Elementary schools and lower forms of Secondary Schools."

Apply to the President, District Educational Council, Tinnevelly, stating salary required, qualifications etc. etc.

M. Sivagnanam,

President.

WANTED.

Applications from educated and qualified men for the post of Assistant Farm Overseer in this depot on Rs. 50-3-75.

2. Applicants should have a knowledge of cultivation of fodder crops such as Oats, Lucerne, Jowari, Cowpea and various kinds of grass and with a certain amount of knowledge of Arboriculture and Vegetable gardening, also the management of bullocks.

Applications should contain the following particulars.

1. Name 2. Age 3. University certificate held 4. Certificate obtained from an Agricultural College. 5. Previous experience on an Agricultural Farm, if any.

J. C. HOTHAM, Major,

Supdt. Hosur Remount Depot.